WORLD PETROLEUM

NOVEMBER 1958

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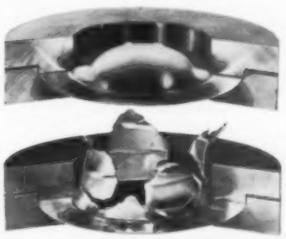

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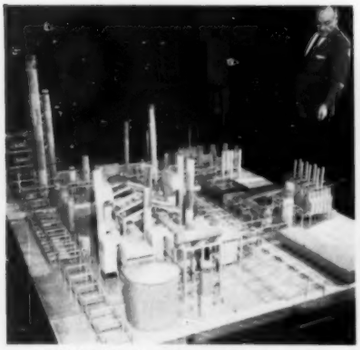
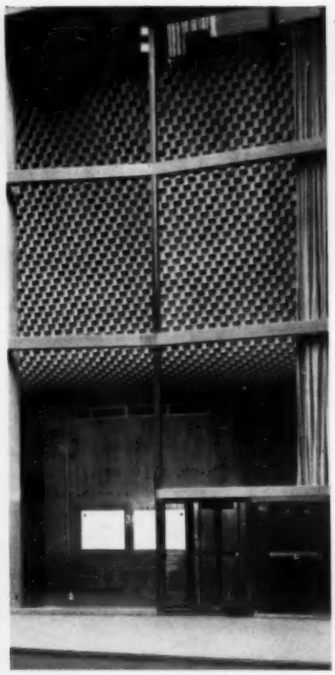


200,000,000 lb. per year ethylene plant



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Beryllium plant

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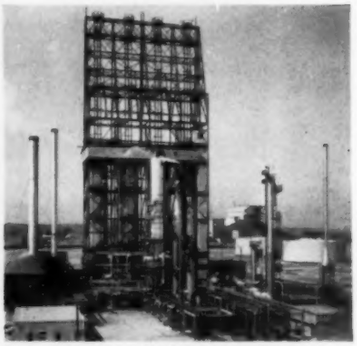

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THIS MONTH'S COVER

Rig. No. 80 of Loffland Brothers Company, Tulsa, operating near the West Texas towns of Wink and Kermit. The color photograph was shot by Jack Hickey of the public relations department of Mid-Continent Supply Co., Forth Worth, and is reproduced through the courtesy of Victor LeMay, manager of the department and company vice president. The colorful photograph is particularly interesting since it depicts the use of air slips in making a connection. The photograph was first published in Loffland Brothers' house magazine *Drilling Business*.

Washington PIPE LINE

by Joseph B. Huttlinger

Elections and Oil

The American oil and gas industry sees at least three issues facing it which may be decided in the national elections in November of one-third of Senate and House. One issue is the fate of a new natural-gas bill. A second is the depletion allowance for crude-oil and natural-gas production—due for more attacks. The third is the rate of excise tax on gasoline, which may be raised.

In addition, a number of antitrust bills and other measures will be pushed—including price-discrimination curbs, slowdown mergers of companies and government construction of $224 million worth of helium-extraction plants.

The elections will determine, perhaps, the outcome of some or all of these measures. The fate of a natural-gas bill, in particular, is largely dependent upon the makeup in the next Congress, which will be decided in the forthcoming elections. The sentiment in the House, especially, has been very closely divided on legislation to ease up the present federal price and other controls over natural-gas producers. A few votes one way or the other might spell defeat or success for the measure.

Senator William Proxmire (D., Wis.) and others who want to shave down the depletion rate to 15% from 27½% have promised a new try next year. With 35 senators out of 96 siding with them this year, they see sentiment for change stronger than ever. They also plan to propose measures to curb use of depletion by US oil operations overseas.

With the highway trust fund due to go in the red about $844 million during fiscal 1960 starting July 1, Congress may be asked to hike the federal tax on gasoline to 4¢, or even 5¢, from 3¢ a gallon. Congress has the final say. Oil-industry leaders claim the point is near when the consumer cannot stand further taxes on gasoline. With state taxes as high as 7¢, average state and federal tax currently is 8.94¢.

With President Eisenhower due to continue for two more years amid signs that Vice President Nixon has inside track for Republican nomination in 1960 presidential elections, a likely running mate is seen in Secretary of the Interior Fred M. Seaton. Scheduled for 35 countrywide major political talks in Alaska, Seaton is strong with the President, and for a time was considered for the post of the assistant to the President upon resignation of Sherman Adams. A newspaper publisher from Nebraska, Seaton has served in the US Senate, Department of Defense, and at the White House as an administrative assistant to the President.

Imports Control

US officials indicate privately they are determined to invoke mandatory controls over crude-oil imports if the present voluntary program collapses. Decision for or against mandatory controls is months off, for it will take that long to put the revised oil imports program into effect and to see whether companies actually do comply. If new program goes into effect January 1, it would take probably two months to give it a test, and another month to collect reports on actual operations during those two months. So April appears earliest date on which mandatory controls might be ordered. But there is reason to believe changes in proposed program of last September could make new program agreeable to bulk of importers, so they would go along.

Particular objection is made to parts of the proposed program giving an import quota to each refiner in Districts I through IV on basis of his past refinery runs—thus giving a quota to refiners who never intended to use one, who will merely sell it to another company. Heavy fire also in being turned on failure of program to give credit to companies which have invested heavily in oil overseas. Cabinet committee on crude-oil imports, of which Secretary of Commerce Sinclair F. Weeks is chairman, will make decision for or against putting new program into effect and its final shape.

Captain Carson proposed last September that crude be held to 826,300 b/d, about the same as now allowed after considering unfinished oils and special treatment for asphaltic crudes. The new part of his proposal was to give each refiner in Districts I through IV a quota based on his past refinery runs—thus cutting some companies' quota as much as two-thirds and raising of others' as much as threefold.

President Eisenhower also showed preference for the quota approach when he acted to impose mandatory quotas on imports of lead and zinc. Imposition of quotas, suggested the President, is better suited than a tariff increase, and a way to share with exporting countries the burdens caused by the present condition of world overproduction. However, in the lead-zinc program, the President made no effort, as with the crude-oil program, to divide up the allowed imports between the various users. In the case of oil, this is the nub of the problem.

The Eisenhower administration takes a dim view of controls over oil products—officials claiming 80% of product imports are residual fuel oil which is not produced in volume by US refiners.

Carson, meanwhile, is using moral suasion on importers to try to get them to obey the voluntary program, and has made public names of "deliberate" violators which he reports to the Department of Defense as ineligible to supply the department with oil products. At start of October, he gave a verbal spanking to two importers, Eastern States Petroleum and Chemical Corp., Houston, and Delta Refining Co., Memphis, Tenn. "Eastern States," he said, "imported a total of 54,000 b/d in August, or 38,200 b/d over its allocation of 15,800 b/d. Delta, ... imported 9,000 b/d, or 6,000 b/d over its allocation. In total, this excess oil is 44,200 b/d, or more than the overall overage."

Canada Gas Export for USA

Paul Kayser, El Paso Natural Gas president, feels natural gas in Alberta and British Columbia represents "the greatest yet undeveloped reserves on the North American continent." He told an FPC hearing that, by acquiring Pacific Northwest Pipeline Corp., "we would have access to those reserves"—pointing out Pacific Northwest had a contract to take 150 million cubic feet of gas daily from West Coast Transmission, which would obtain the gas from Savannah Creek and other fields, "fields of the greatest potential in Canada."

Mr. Kayser told Canadian authorities this gas export to USA would be desirable. "We did the best we could to help West Coast get that permit, and I still think we will get the permit. Of course, you still have to go through the authorities at Ottawa for a permit from the Dominion. The Alberta commission has authority over the permit from the province."

El Paso completed the purchase of 99.8% of the stock of Pacific Northwest last year. Now it seeks FPC permission to merge the two companies into a combined unit for operating efficiency. The Department of Justice, meanwhile, has filed suit to block the merger on grounds it would lead to a monopoly in the supply of gas to the West Coast. DJ also wants El Paso ordered to dispose of its stock in Pacific Northwest. The merged corporation would have more than 10,000 miles of main pipeline, and sell more than 2.3 billion cubic feet daily of gas. Combined assets would be more than $1.3 billion.

US District Judge Ritter, at Salt Lake City, denied a preliminary injunction against a merger in September. Pretrial matters are set before the court for November 3, and start of trial November 17. With prospect of decisions both from a district court and the FPC, if they are at odds with each other matter could wind up at US Supreme Court which would be asked to decide whether the FPC or the courts have final authority. The question has never been answered in the courts.

Antitrust Revival

The USA oil companies accused of a conspiracy to fix crude and gasoline prices must face trial after all. US District Judge Albert V. Bryan, of Alexandria, Va., refused oil-company motions to dismiss the criminal indictment on grounds federal grand jury which returned it was improperly chosen. The judge did grant oil-company motions to transfer the case, however, to Tulsa, Okla. DJ attorneys, however, opposed the shift as "inconvenient" to them. The trial won't start until next year. It will be before US District Judge Savage, with reputation for speedy handling of such cases and an antitrust authority. US attorney assert privately shift to Tulsa stands to benefit the government, prosecutor in the case—explaining government antitrust staff which will go to Tulsa will have a relatively free hand away from top officials in Washington; also Judge Savage is likely to be more sympathetic; and they expect public sympathy with government's side of the case when point is made that the 29 oil companies fixed the price of products at a higher level than warranted by the spread between crude prices. US attorneys hope to have oil producers with them when this point is made.

Judge Bryan denied the motion to dismiss after hearing arguments from Simon H. Rifkind, law partner of Adlai Stevenson. A former US District Judge in New York, Rifkind was retained by Cities Service Oil Co., a defendant. The USA, meanwhile, has been considering filing a parallel civil case against the companies; then, if it loses criminal case, it would have another shot at winning prosecution.

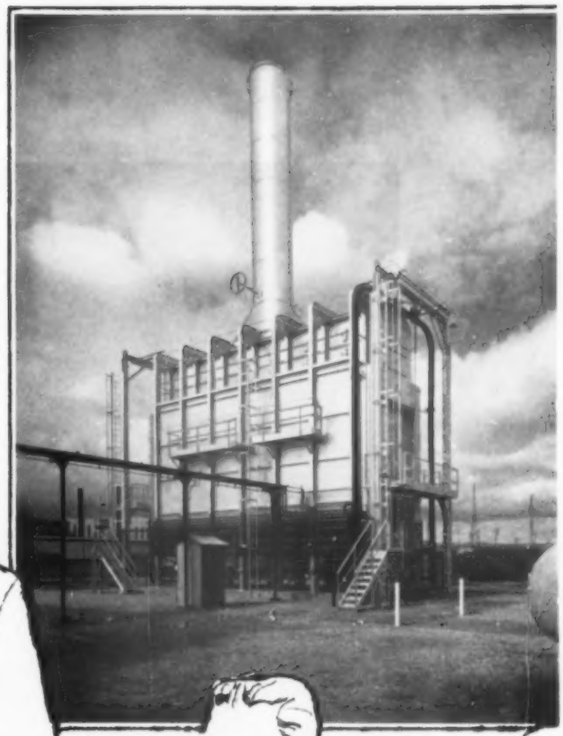
Marketing Divorcement

The Department of Justice, pressing a broad antitrust action against the seven major oil companies on the West Coast, has asked the court to order the companies to get rid of all their interests in gasoline stations. DJ argued that, unless the majors are forced out of the retail end of the gasoline business, they will continue to "control" prices and marketing of gasoline. They would be barred, too, from operating stations through consignees or agents.

Government's position was outlined in a summary of the DJ's proposal for relief and its probable economic effects, which was filed with US District Judge James Carter. Trial starts in November.

The antitrust case, filed years ago, is against the Conservation Committee of California Oil Producers; and Standard of California, Shell, Texaco, Richfield, General Petroleum, Tidewater, and Union Oil. END

BORN BUILDS BETTER HEATERS



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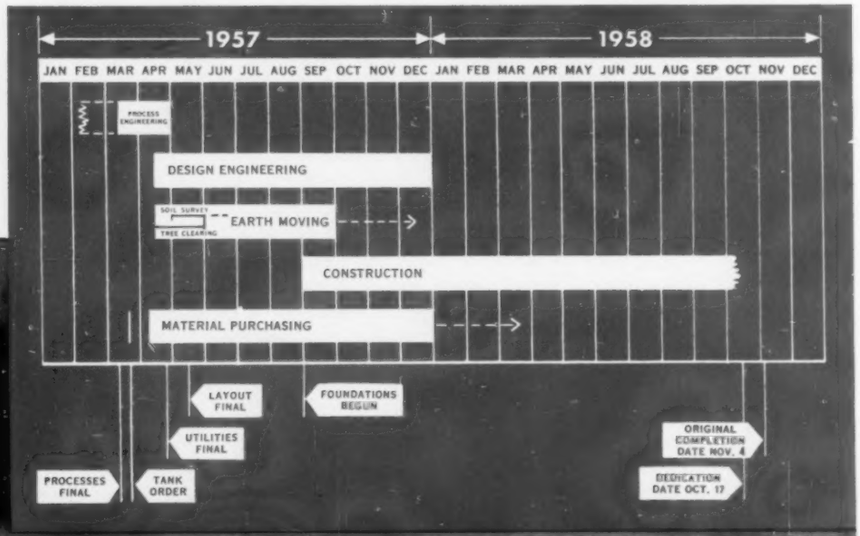
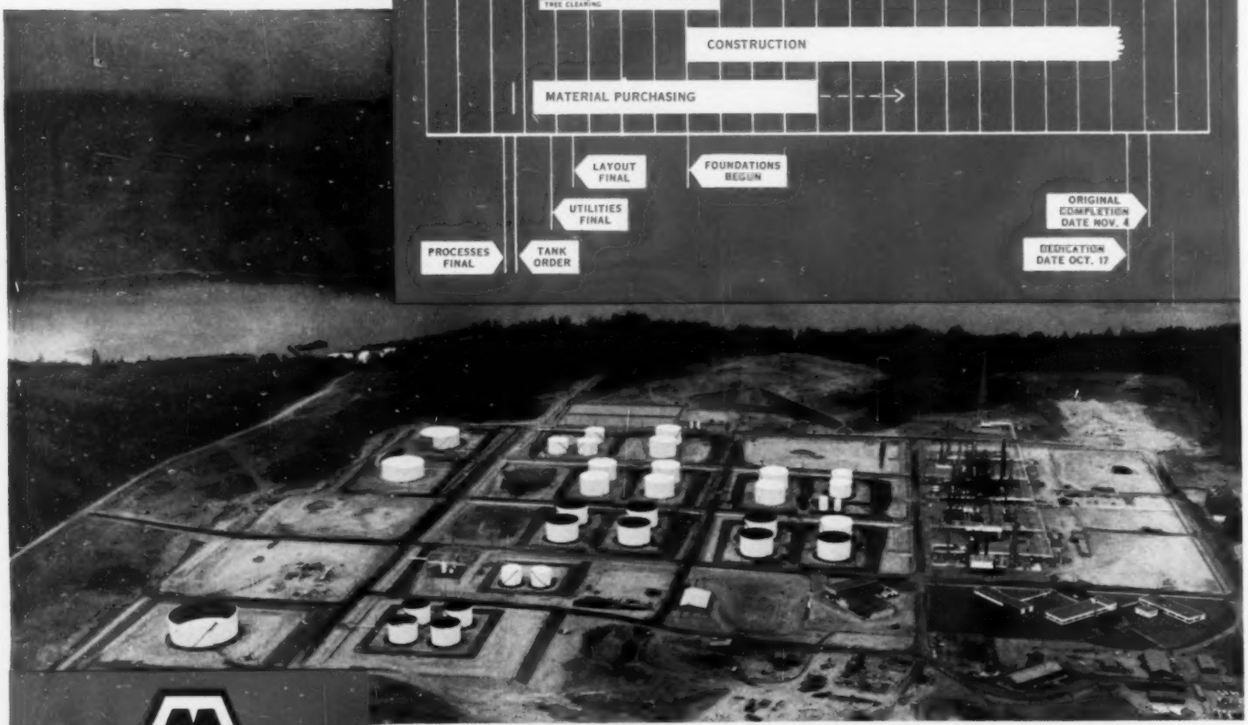
One of the first things Canadian Kellogg required were horses—the only transportation the engineers could use to negotiate the muddy conditions on the site. But a strategically placed drainage and pumping system soon dried the ground and proved so effective that after its installation not one day's labor was lost through wet conditions. Other practical solutions to construction problems, plus the most advanced chemical engineering, have made the investment per barrel capacity of the B/A Port Moody refinery relatively very low.

Right from the start Canadian Kellogg's experience and B/A's cooperation pushed the job ahead of schedule. Of course, B/A and Canadian Kellogg have worked together before. The Port Moody contract was awarded to Canadian Kellogg mainly on past performance . . . this move in itself saved the time and money normally spent preparing and analyzing detail bids. Mutual respect between client and contractor was one of the outstanding factors that contributed to the speedy completion of the project.

Right: *Chart shows rapid construction progress made on the Port Moody project.* Below: *Air view of new B/A Port Moody refinery, Vancouver, British Columbia. Process section, right, is subdivided into five areas: (1) Crude Unit, (2) Catalytic Reformer and Distillate Desulfurization Unit, (3) Utility Plant, (4) Orthoflow® Fluid Cat Cracker, and (5) Alkylation Unit.*





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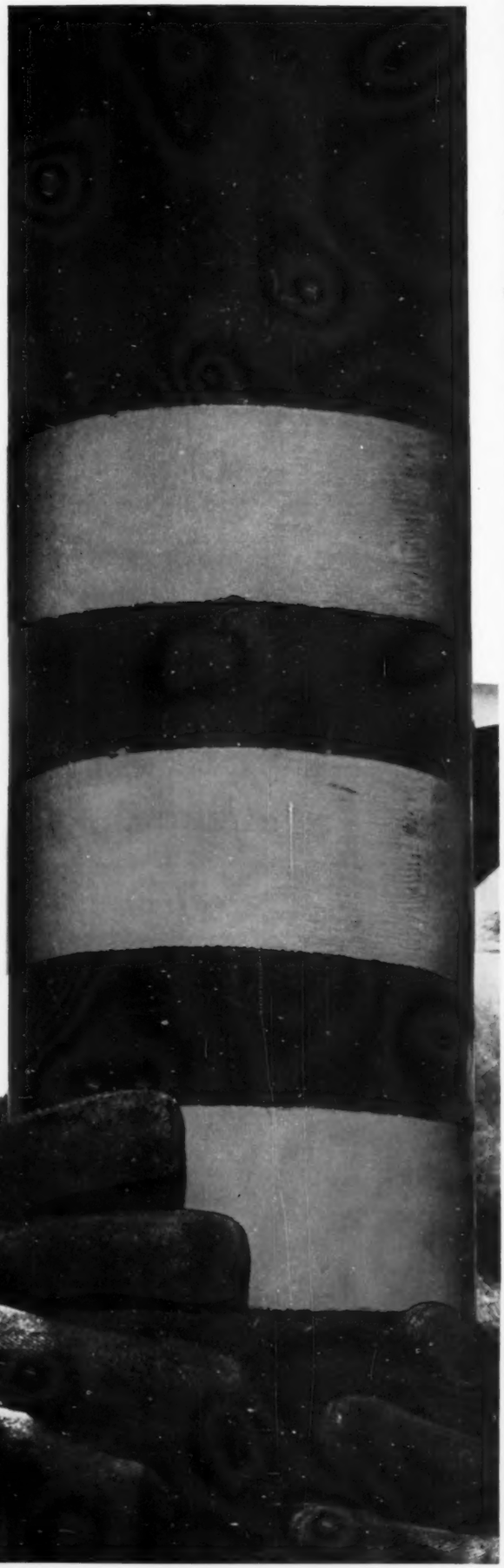

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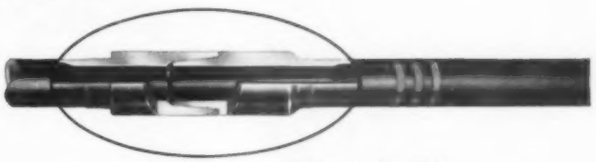
LIGHTWEIGHT GRADE E DRILL PIPE

SIZE (OD)	INCHES	2⅞"	3½"	4"	4½"	5"
Weight*	Lb./Ft.	6.85	9.50	11.85	13.75	15.0
Wall Thickness	Inches	.217	.254	.262	.271	.296
Tension Data (Minimum Values)						
Load at Minimum Yield	Lbs.	135,900	194,270	230,760	270,030	328,070
Equivalent Length	Ft.	19,840	20,450	19,480	19,640	21,870
Collapse Data (Minimum Values)						
Collapse Pressure	PSI	8,380	8,080	7,080	6,290	6,140
Setting Depth (S.F. = 1⅛)	Ft.	14,900	14,370	12,590	11,180	10,920
Internal Pressure at Minimum Yield	PSI	9,980	9,600	8,660	7,900	7,830

*Tentative API Weights

YOUNGSTOWN LIGHTWEIGHT DRILL PIPE



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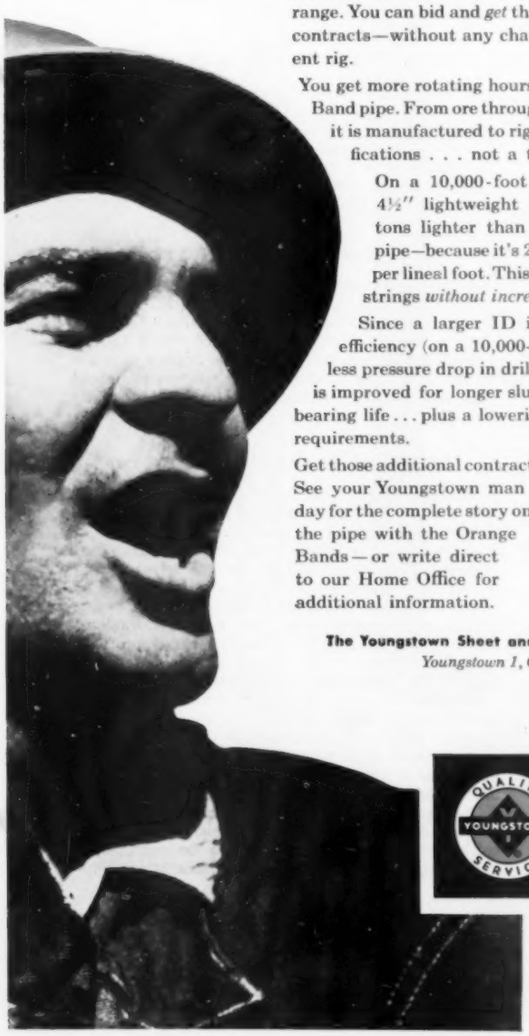

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On a 10,000-foot hole, a string of 4½" lightweight drill pipe is 18½ tons lighter than 4½" regular drill pipe—because it's 2.85 pounds lighter per lineal foot. This means longer drill strings *without increased weight.*

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LONDON LETTER

By A. L. Paget

40,900 dwt oil tanker "Bideford," built by Kockums Mekaniska Verstad, Malmo in Sweden, and chartered to Esso Petroleum Co. Ltd.

On the platform at the launching of S.S. "Varicella" are (left to right) W. E. J. Hunter, chairman of the builders Swan, Hunter & Wigham Richardson Ltd.; Lady Harper, wife of Sir Kenneth Harper, a director of Shell Transport & Trading Co. Ltd.; and Mrs. Hunter.

Tanker News

The Bideford Tanker Co., of London, has taken delivery of the turbine-driven oil tanker "Bideford," built and engined by Kockums Mekaniska Verkstad, Malmo. This 40,900 dwt vessel temporarily raises the yard's Scandinavian record by 150 tons, previous one having been held by the 40,750 dwt "World Spirit" delivered to the Niarchos group in February. "Bideford" is claimed to the the largest 100% all-welded vessel now in commission. The riveted crack arresters, previously always compulsory for tankers of such dimensions, have been replaced by welded joints, in return for which the steel employed is of extra-high notch toughness. The vessel is under a long-term charter to the Esso Petroleum Co. Ltd. She left Sweden, September 5, for Baniyas to load for Fawley.

It has been reported that the final cost of the Peninsular & Oriental Steam Navigation group's oil-tanker program may be nearly £50 million—£13 million higher than the estimate made three years ago when P & O decided to enter the tanker field. This rise in costs has occurred despite a reduction from 25 to 17 in the number of tankers to be built. All the ships are to be constructed in UK yards. Lord Geddes, a director of P & O and tanker adviser to the group, revealed that half of the tanker fleet will be "destined for the service of the British Petroleum Co." He was speaking after the launching of the 18,500 dwt "Lincoln" for Federal Steam Navigation, and admitted the tanker program had been through various modifications. Five million tons of tankers were now laid up, and the apparent surplus might grow, he said, before it started to shrink.

Earlier this year another big shipping organization, British & Commonwealth Shipping Co., announced it had decided to abandon a £5½ million tanker-building program. No official reason was given, but depression in the tanker industry might have been a consideration. The company switched its plans to building dry-cargo vessels.

The single-screw steam turbine-driven tank vessel "Belgulf Progress," built for Gulf Oil (Belgium) SA, was launched at the Haverton Hill shipyard of the Furness Shipbuilding Co. Ltd., September 13. She is the 166th tanker to be constructed by the builders and the ninth for Gulf Oil Corp. and associates. The vessel is of the poop, bridge, and forecastle type with turbine machinery fitted aft. This consists of a set of Richardson Westgarth's steam turbines driving a single propeller through double-reduction gearing and capable of developing 7,300 shp at 100 rpm, with a maximum power of 8,200 shp at 104 rpm.

At its Belfast shipyard, Harland & Wolff Ltd. completed a new oil tanker for Texaco, the "New Mexico," of 27,750 dwt. The vessel was handed over to her owners on the successful completion of her sea trials. This is the second of two sister ships by Harland & Wolff for Texaco; the first was the "Missouri" completed last year. The "New Mexico" is a single-screw steam-turbine tanker—propelling machinery consisting of a single-shaft arrangement of compound, double-reduction geared turbines capable of developing 12,500 shp at a propeller speed of 100 rpm. The HP ahead turbine is of the impulse-reaction type, and the LR ahead turbine is of the single-flow reaction type. An impulse-type astern turbine is incorporated in the LP turbine casing.

The 19,100 dwt turbine tanker, "Queda," built by Scott's Shipbuilding & Engineering Co. Ltd., Greenock, for British India Steam Navigation Co., was launched in August. The propelling machinery consists of one set of steam turbines with double-reduction articulated type gearing capable of developing a total of 8,000 shp on service to give a speed of 14½ knots. Electrical power is supplied by two turbine-driven alternators, each of 550-kw, and one diesel alternator of 200-kw for emergency use.

With the launching, July 30, at Wallsend-on-Tyne, of the 33,000 dwt tanker "Varicella," total tonnage of shipping built for Shell Tankers Ltd. over the past 55 years by Swan, Hunter & Wigham Richardson reached the half-million mark.

Fresh Water from the Sea

The Water Board of Guernsey has ordered the first sea-water evaporating and distilling plant for commercial operation in a country with adequate rainfall. The plant will give half-a-million gallons daily from the sea more cheaply than the cost of reservoirs for collecting rain.

The Guernsey plant will be supplied by G. & T. Weir Ltd., Glasgow, which already has supplied plant producing three-quarters of the world's total output of fresh water from sea water. A deaerator unit will remove gases from the incoming sea water, and chemical treatment will prevent formation of scale inside the plant.

Returns from Iraq Visit

G. H. Herridge, managing director of Iraq Petroleum and associated companies, has returned from a tour of operations in Iraq. In Baghdad, he informed the government he was impressed by the measures it had taken to insure the continuance of operation, and assured it of the continued cooperation of the companies. The Iraqi ministers assured Mr. Herridge of their intention to honor existing agreements, reserving their right to invoke the terms of their letter of September 1951 which stated that, in the event a neighboring country receives a higher average revenue per ton of oil exported than was currently received by Iraq, the government would claim to receive no less. Welcoming the ministers' assurance, Mr. Herridge pointed out that the circumstances envisaged by the 1951 letter had not arisen; but that, if they should arise, the company would be willing to consider and discuss the position.

Outstanding differences between the previous government and the companies regarding the calculation of the government's share of profits in respect of 1955 and 1956 were reviewed, and the government indicated its willingness to apply the mechanism for settling disputes provided in the agreement, which may involve arbitration. Mr. Herridge explained to the government the companies' plans for increasing productive and export facilities which, by the end of 1961, would permit a total export from Iraq at a rate of approximately 57 million tons a year. The government was also informed of the companies' agreement in principle to the relinquishment of portions of the areas covered by their concessions, and the companies undertook to frame proposals for further discussion.

New Range of Steam Turbines

A new range of small high-speed geared steam turbines, rated 200-hp to 1,000-hp, has recently been announced by J. P. Hall & Sons Ltd., Peterborough, for driving cargo pumps in oil tankers. Other duties for which it is adapted include pump and compressor drives, exhausting either to vacuum or against back pressure.

Floating Pipeline in Cyprus

An unusual problem in welded fabrication by the Scientific Welding Co, of Grays, Essex, England, involved a pipeline recently completed near Limassol, Cyprus. The line is 2,800 ft long, of which 1,800 ft project out to sea. At that end, a flexible pipe attached to a buoy is available for tankers to unload their cargoes. This enables diesel fuel to be rapidly landed without the need for a jetty.

1,200 Visitors at Grangemouth

"Scottish Week" was the first week in September and, as part of the activities, BP's Grangemouth refinery was opened to the public on three days, transport being provided from both Edinburgh and Glasgow. More than 1,200 people took advantage of seeing the various units at the refinery, as well as some new ones being erected. Next year, when present extensions are completed, annual throughput capacity will be 3,200,000 tons. Present throughput is 2,200,000 tons.

Other oil companies are following a similar line. During the last week of August and the first weeks of September, Mobil Oil had "open house" at its Coryton refinery. B. R. Fraser, Mobil Oil's Coryton manager said, if successful, we will extend it (open house) at a later date to local residents in other areas along the north bank of the Thames.

Coryton refines about 1¾ million tons of Middle East crude a year, and supplies high-grade motor spirit and a full range of lube oils for automotive, industrial, and marine consumers internationally.

Acknowledgment

In the article entitled "Refinery Expansion in the Western World" in World Petroleum July 15, the author wishes to make acknowledgment to *Petroleum Press Service*, London, for permission to include Table I and for other information supplied.

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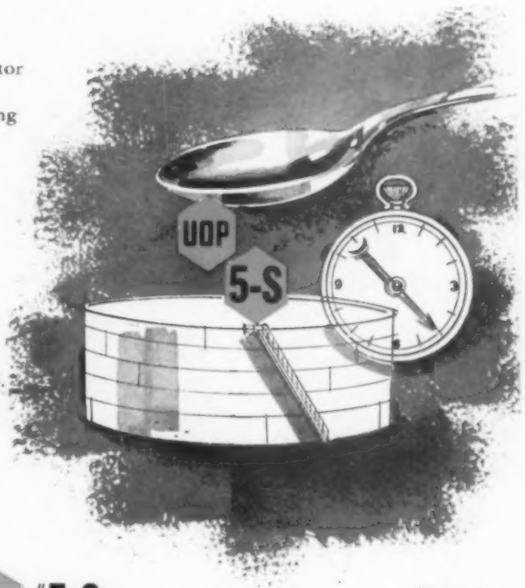

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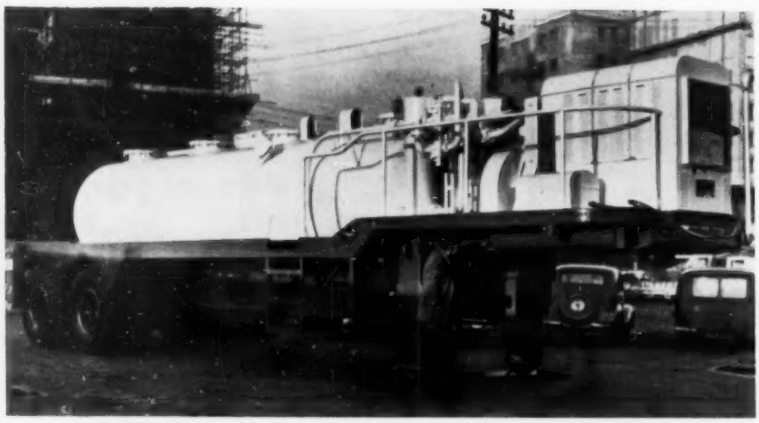
LATIN AMERICAN OIL NEWS



One of two of the largest mobile oil-field mud tanks from UK shipped to Venezuela (Shell photo).

Mobile Mud Tanks For Venezuela

Two of the largest mobile tanks—first of their type—designed to carry oil-field drilling mud, were shipped recently to CIA. Shell de Venezuela Ltd. Costing about £7,000, each consists mainly of a 4,500-Imperial-gallon (5,400 USA gallon) gross-capacity vacuum tank with engine and compressor, mounted on a 50-ton heavy-duty semi-trailer of special design. These mud tanks—manufactured to Shell's requirements by Bristowes Machinery Ltd. of Edmonton, North London—each is 27 ft in overall length; 6 ft in diameter; fitted with catwalks and four inspection manholes in the top. Filling is by vacuum, and discharge by compressed air at 30 psi pressure. The reciprocating compressor is coupled to a Perkins diesel-power unit—both carried on the raised front deck of the massive semi-trailer. To insure low center of gravity, a dropped-frame construction is used. To afford easy coupling and uncoupling, the semi-trailer is equipped with extra heavy-duty hydraulic landing gear which can support and raise the front end of the semi-trailer even when fully laden. It is also fitted with a full-width landing pan to avoid sinkage when uncoupled on soft ground.

Venezuela's Petrochemicals Change

Minister of Mines and Hydrocarbons de la Cova recently broadcast nationally for public support of his proposed reorganization of Venezuela's Petrochemical Inst. (Petroquimica). First step was to name Dr. Gustavo Thery Fombona, formerly director of hydrocarbons, as honorary president of the institute, with appointment of new executive council to work on Petroquimica's rejuvenation.

Brazilians for Mixed Commission

Once Brazilian government has given approval to successful bidders for exploring 3½-million-acre Mixed Commission region, Bolivian government must also approve. Though number of Brazilians are reported interested in the Bolivian operation, only one group thus far has been identified, Petroleo Andino SA, organized in Brazil expressly for bidding on the acreage.

Two More Venezuelan Sun Wells

Two more oil-producing wells have been completed by the Venezuelan Sun Oil Co., Venezuelan Atlantic Refining Co., and Texaco Seaboard Inc. group on their Block No. 1 concession in Venezuela's prolific Lake Maracaibo. Venezuelan Sun, the operator, announced the two wells tested at the total rate of 9,385 b/d. Both were completed in the Eocene horizon.

SVS No. 16, the larger of the two wells, was completed as a dual producer and, on ¾-in. chokes, tested 3,265 b/d of 35.2 gravity oil and 5,180 b/d of 35.7 oil, both from the Eocene sands.

SVS No. 15 flowed 940 b/d of 35.4 gravity oil on a ½-in. choke, with perforations between 8,447 ft and 8,594 ft.

15,000 B/D Refinery for Cuba

International Industries Inc. (N.J. corporation) has signed contract with Cuban government for $4 million 15,000 b/d refinery in Gulf of Fonseca area. Pipeline and other facilities will raise cost to $15 to $20 million. For 24-month completion, construction will start with nine months of National Congress' approval.

Guatemalan Refinery

A 3,500 b/d refinery is planned. Breaux Bridge Oil Refining Co. intends to form a separate company in which the Royal Dutch-Shell group of companies and the Canadian Eagle Oil Co. will participate. Common equity will be divided equally between Breaux Bridge and the Shell-Eagle interests.

Argentina to Buy in Britain

Group of British manufacturers has signed contract to deliver $140 million of oil-field and other equipment to YPF. With 20% down payment, balance can be paid over next five years. Among suppliers are Henry Balfour & Co., General Electric, William Press & Son Ltd., Mitchell Engineering Group, and Paterson Engineering.

Colombia to Up Refining

Increase in output of Mares concession field by 1963 to 55,000 b/d from present 28,000 is planned by Empresa Colombiana de Petroleos, government-owned company.

Increase La Salina Storage

Creole Petroleum Corp. is building five giant storage tanks for crude oil at La Salina on Lake Maracaibo. Each of the tanks will have a capacity of 268,000 bbl. Floating roofs are made of double plate. Two will be in the storage yard, and three on the platform of the new La Salina terminal.

Oil Equipment for Brazil

At the invitation of Brazil's oil monopoly, Petrobras, representatives of a British consortium recently visited Brazil to negotiate for the supply of equipment for a new refinery to be constructed near Rio de Janeiro. Foster Wheeler has been retained by Petrobras for the design, engineering, and supervision of the refinery. The consortium, known as BREFCON, is headed by Babcock & Wilcox Ltd., The British Thomson-Houston Export Co., Ltd., Stewarts & Lloyds Ltd., and John Thompson, Ltd. Balfour, Beatty & Co. Ltd. are acting in a secretarial and coordinating capacity. Brefcon has received from Petrobras a contractual letter of their intention to purchase a minimum of £4 million worth of equipment for the new oil refinery. These negotiations were satisfactorily concluded in the face of French, German, and Italian competition.

Panama's Imports

Panama increased imports of diesel fuel from 240,317 bbl in 1956 to 385,247 bbl in 1957. The jump was 60.3%. Reasons are expansion of shrimp industry and accelerated construction on the Inter-American highway and other road work.

Motor lubricating-oil imports climbed from 19,998 bbl in 1956 to 23,300 bbl in 1957, or 16.5%; and gasoline imports climbed 15.5%, from 686,335 bbl to 792,739 bbl in 1957.

Lube-oil and gasoline increases are attributed to application of a treaty of mutual understandings of 1955 which bars aliens employed by USA government in the Canal Zone from purchasing from retail sources other than in the Republic of Panama when they live in Panama.

Over the long run, imports are equal to consumption, as Panama has no commercial production of crude or refinery production of products.

Creole To Spend $21 Million

Creole Petroleum Corp. will advance construction schedules on $21 million worth of projects in many parts of Venezuela, to help Venezuelan government and the nation's commerce and industry, and to combat unemployment. Creole has a gross plant investment in Venezuela of approximately $1.5 billion.

Football Night at Houston Nomads

Houston Nomads were treated to a combined Rice Institute-University of Houston football night at the College Inn, September 8. The largest number of Nomads ever to attend a Houston dinner meeting were present. Chairman of the evening was Lloyd Gregory of Gregory-Giezendanner Co. He was introduced by Buster Becker of Atlas Pipe Inc.; president Ed Louden was presiding officer.

International guests included (left to right), front row: Carlos Amorim, Petrobras, Brazil; Robert Ford, Schlumberger Surenco, Venezuela; R. Henderson, Henderson Oil Well Drilling Co., Trinidad; George S. Ormsby, Pioneer Specialties Inc., Houston. Back row: L. Camacho, Bolivian Consulate, Houston; Richard Engebrecht, Asiatic Petroleum; W. W. Gehrig, Reed Roller Bit Co., Berlin; Reeves Morgan, Socony Mobil, Turkey; Andre Casassus, CFPA, Algiers; W. H. Archer and Ralph Redd, Southeastern Drilling Co., Turkey.

WILLIAM F. BUCKLEY

William Frank Buckley, independent international oil man, died in New York on October 5 at age 77. At the time of his death, he was president of the Catawba Corp., New York, representative of companies engaged in exploration abroad. He also was president of Pan-Israel Oil Corp. Born and educated in Texas, he established with his brothers the law firm of Buckley & Buckley to represent major oil companies in Mexico, but gave up this practice in 1913 to become an independent oil operator as head of Pantepec Oil Co. of Mexico. Other companies he organized were Pancoastal Oil Co., with concessions in Venezuela and Florida; Coastal Caribbean Oils Inc., Canada Southern Oils Ltd.; San Jose Petroleum Inc., to explore in the Philippines; and two Middle East companies for exploration on the Greek Island of Zakynthos for American Grecian Oil Co.

DU PONT *Petroleum Chemicals* NEWS

Number 92 in a Series of Bulletins for the Petroleum Industry

NOVEMBER 1958

Progress report on "rumble" and "thud" studies

FOA-2 makes costly tank cleaning unnecessary

Recently another case history of dollars saved through fuel oil improvement came to Du Pont: No. 6 residual fuel was being burned at a factory in upstate New York. This plant uses about 3 million gallons of fuel per year. It is first delivered to a 300,000-gallon storage tank and then transferred to a 17,000-gallon horizontal work tank.

Sludge build-up meant costly clean-outs

Sludge was playing havoc with the work tank, largely because the inlet and outlet connections were located at its head end, and sludge built up rapidly at the far end. When it reached a depth of several feet, it threatened to interfere with suction pipe operation. So every few months it was necessary to open the tank, and send a work crew inside to remove the accumulation manually. A "messy," time-consuming and costly job.

How FOA-2 solved the problem

Last February about 10-15 gallons of Du Pont Fuel Oil Additive No. 2 was poured into this tank, in the hope that it would stabilize the fuel and reduce sludging, thus extending the time between clean-outs. After the fuel in the tank had been consumed in the normal manner, it was quickly discovered that virtually no sludge remained. The additive had solubilized and dispersed the sludge, and stabilized the fuel. Therefore the plant promptly adopted a program of treating its fuel oil with FOA-2 to eliminate the costly clean-out operation.

If you or your customers are experiencing fuel oil sludging problems, let your Du Pont representative work out a solution for you.

Five years ago, researchers in the Du Pont Petroleum Laboratory isolated a new phenomenon in the performance of high-compression ratio engines. They called it "rumble."

THE CHASSIS DYNAMOMETER setup at the Du Pont Petroleum Laboratory is helpful to Du Pont engineers in pinpointing the causes and effects of rumble and thud in high-compression ratio engines.

"Rumble," a low-pitched noise produced in engines of about 9.5:1 or higher compression ratio, is usually noticeable on hills or during accelerations above 40 or 50 miles per hour and when the throttle is wide, or nearly wide, open. Laboratory tests show that it is associated with a high rate of pressure rise within the cylinders of such engines, plus the presence of combustion chamber deposits.

Now—"Thud"

Another low-pitched noise has been noted in tests at the Du Pont Laboratory. It has been given the name "thud."

"Thud" takes place in the same types of high-compression ratio engines as "rumble," with one significant difference – it can occur in the absence of combustion chamber deposits.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

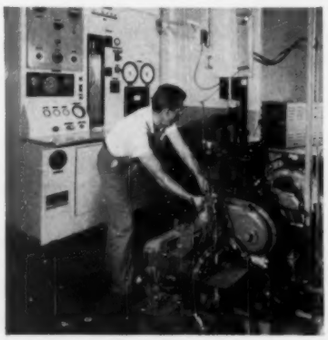
OVER

DU PONT *Petroleum Chemicals* NEWS

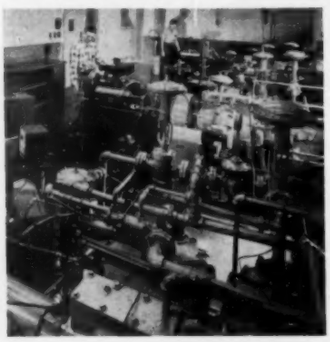
CONTINUED *"rumble and thud"*

Investigations of both rumble and thud are going on today, in engines in the Du Pont Petroleum Laboratory. Gasoline technology stands to benefit importantly from these tests, as it has in the past from Du Pont investigations of "knock" and "wild ping."

Through these and other studies of combustion phenomena, Du Pont automotive engineers have gained extensive working knowledge of the behavior of hydrocarbons. This helps Du Pont work with refiners in blending gasoline stocks for optimum performance and lowest manufacturing costs.



▲ **LABORATORY,** as well as on-the-road and dynamometer engine tests, are employed by Du Pont scientists in their studies to uncover every detail related to rumble and thud. ▼



Details available to you

Numerous papers have been presented by Du Pont technologists on the subjects of rumble, thud, knock and ping. Your Du Pont Petroleum Chemicals representative will gladly get copies for you.

YOU OUGHT TO KNOW . . .

E. HEARN SIMPSON, Sales Manager of Du Pont's Petroleum Chemicals Division, joined the company in 1930 in the Fabrics and Finishes Department. Two years later he was transferred to the Organic Chemicals Department and for a number of years he was a salesman of products as diverse as industrial alcohol, anti-freeze and gasoline antioxidants.

Five years were devoted to sales of the latter, in both the Mid-Continent and Gulf Coast regions.

Hearn Simpson's career at Du Pont was interrupted for three years while he served as a naval officer on aircraft carriers in the Pacific theater of operations.

On his return to Du Pont in 1946, Mr. Simpson was made sales manager of alcohol and camphor. He was elevated to his present position in 1950.

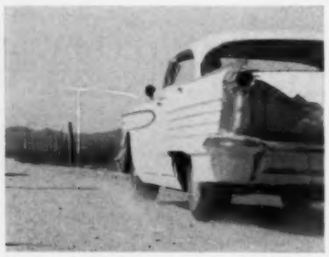
Mr. Simpson attended Colorado University and was graduated from the University of Denver with a Bachelor of Science degree.

Nylon cord tires a step toward highway safety

On today's turnpikes and thruways, four tire hazards are becoming increasingly serious. Tires with nylon cord are a long step toward eliminating them all.

Heat is the biggest threat. Sustained speeds of 60 or more miles per hour are not unusual on many of our superhighways. Nylon resists the effects of heat, reducing the chances of tire failure at these critical speeds.

The particular problem with heat is that it has a way of bringing out the worst in a tire, of finding and preying upon all the defects that may have come about through bruising, moisture and flex fatigue, the other three tire hazards.



Nylon corded tires have high resistance to heat.

Tough nylon safely withstands violent twists, bends and flexing without damage to the tire. And the chemical nature of nylon is such that moisture doesn't harm it.

As America's superhighway program moves forward, the demand for safe, reliable protection will result in the increased use of tires corded with nylon, another petrochemical product made possible by the cooperation of the petroleum and chemical industries.

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OVER

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

A-8064

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Libya Exploration Society

The Petroleum Exploration Society of Libya recently has been organized in Tripoli. Officers for the year 1958 are: president, Donald M. West, Mobile Oil of Canada, Ltd; first vice president, J. Allen Sawyer, Esso Standard (Libya) Inc.; second vice president, Jacque Canaple, Compagnie des Pétroles Total (Libya); secretary, Daniel K. Hamilton, American Overseas Petroleum Ltd.; treasurer, Alex Stoupnitsky, Compagnie Générale de Geophysique; director, Sam. B. Frazier, Gulf Oil Co. of Libya; director, Ronald C. MacLean, D'Arcy Exploration Co. (Africa) Ltd.

Luncheon meetings are held the second Friday of each month; guests are welcome.

Dual-Method Meter

A Hi-Cap metering separator featuring controls which allow oil metering by either volume or weight has been shipped by the Rolo Manufacturing Co. of Houston to a customer in Venezuela. By a simple minor adjustment, the unit can be changed from volumetric metering to weight metering. The latter is especially desirable for foamy crudes. The Rolo Hi-Cap metering separator has a capacity of up to 30,000 b/d.

Test Low Hydrogen Electrodes

Trans-Arabian Pipe Line Co. has conducted a series of tests of low-hydrogen welding electrodes for mainline pipe. Bands and patches were welded to a test section containing cool water at 100 psig to simulate field conditions. The test section was tested to the failing point at 1,490 psig. Low-hydrogen wells revealed fewest flaws, and now are recommended for lapwelds fused to the wall of the line.

USSR Chemical Industry

For the development of the chemical industry, Russia has allocated in excess of 100,000 million rubles. This is equivalent to some £9,000 million at the official rate of exchange. Most of the new units will use field or refinery gas, and be erected in proximity to these. It is intended, in particular, to expand during 1957-65 the capacity for producing artificial and synthetic fibers by 4.6 times; that for plastics and synthetic resins eight times; and that for synthetic rubber 3.4 times. The output of consumer goods will increase as more materials are made available to the chemical industry.

It is reported from Moscow an extensive oil-bearing area has been discovered in west and southwest Lithuania—including the district of Kaliningrad (Königsberg), which was part of Germany up to World War II.

World Petroleum Congress Tours

Petroleum scientists and technologists visiting the USA from 47 countries next year during the Fifth World Petroleum Congress will be able to see this country's first full-scale atomic power station at Shippingport, Pa., and the Brookhaven National Laboratory for Atomic Research, on Long Island.

Details of these projects have been announced from the New York headquarters of the congress, and are included in a program of 13 industrial tours being officially scheduled in conjunction with the congress. The visits to these plants will tie in with a symposium on the use of atomic energy in the oil industry.

These and other tours are scheduled for the week preceding and the week following the congress. Tours have been arranged for visitors to inspect Texas oil fields; offshore producing and exploration areas in the Gulf of Mexico; laboratories, refineries, and transportation facilities in the South, West, Midwest, and East Coast. They will include also the International Petroleum Exposition in Tulsa.

SONJ Enters Petrochemicals

Standard Oil Co. (N.J.) has disclosed plans to produce and sell polypropylene, its first entry into the petrochemical plastics field. Jersey's Humble affiliate will produce the new product, used for making articles, as well as films and sheetings, at a new plant in Texas. Marketing will be handled by Enjay Co., a subsidiary, through its own facilities and through Spencer Chemical Co.

Oil Equipment Sales Up 7.3%

On the basis of 412 reports out of a possible 455, the 1957 dollar value of products and services sold within the oil industry by equipment and service companies in 1957 was $1,132,995,694, according to figures released by Petroleum Equipment Suppliers Assn. Estimates are that final 1957 figure probably will approximate $1,175 million, an increase of 7.3% over the 1955 total of $1,096,599,858.

Of the dollar volume reported for last year, 66.7% of total resulted from operations of firms in four areas—Houston, Los Angeles, Tulsa, and Dallas-Fort Worth. In 1955, these four areas accounted for 68% of the total; and in 1954, 61.9% of the total. The dollar volume figures are (incomplete): 1957—$755,648,873; 1955—$745,562,462; and 1954—$575,063,-908.

Dowell Catalogs

Dowell Inc., Tulsa, has published a complete catalog of Dowell services and products for the oil industry. Included are reports on fracturing, acidizing, cementing, electric-pilot and acid cleaning, and other services. A second catalog gives use data and specifications for Dowell's packaged products. Copies of both are available on request to Dowell.

New Refinery for Italy

Soc. Nazionale Metanodotti, ENI subsidiary, won a $9 million contract for construction of a 6,400 b/d refinery at Zarkah, north of Amman. Jordanian Oil Refinery Co. (50% government-owned) awarded the contract. A separate contract soon will go to one of 10 international bidders for a 30-mile pipeline for delivery of crude to the refinery from Tapline.

Kuwait's for Arab League

Kuwait's Deputy Ruler Moubarak El Sahab said in Cairo his country is prepared to join Arab League and contribute to the Arab development bank.

Soviets Report Per-Well Output

Average output per well in Soviet Union is 64 b/d, according to Russian reports. The 35,000 wells in the country produce a total 2,240,000 b/d.

UN Far East Oil Meeting

UN Commission for Asia and Far East (ESCAFE) has scheduled symposium in New Delhi in December 3-16 on development of oil resources in that area. US State Department is seeking technical support of USA oil companies with Asian experience, especially Stanvac and Caltex.

Provisional agenda includes: petroleum industry of the ESCAFE region; geology of petroleum deposits, with special reference to Asia and the Far East; petroleum potentialities and development possibilities in the ESCAFE region; petroluem exploration status and methods; recent developments in the search for oil in the continental shelf; petroleum development programs (analyses of annual and overall expenditures); regulations governing petroleum development; safety in petroleum exploration and development; technical manpower and equipment for exploration, production, and refining, together with training facilities for local staff; and adoption of the report of the symposium.

Alaska Cons. Gets Iniskin

Alaska Consolidated Oil Co. has acquired the 51,000-acre site of the Iniskin Unit Operators Inc. in Alaska from the Havenstrite Oil Co. of Los Angeles. Located on the west shore of Cook Inlet, opposite the Kenai peninsula, the Iniskin unit was the first deep test well drilled in Alaska. Started in 1954, the Iniskin well has now reached a depth of 9,745 ft, with over 3,000 ft of vertical oil-saturated section.

Kerr-McGee Moves Offices

Crude-oil purchases and sales department and pipeline operations department of Kerr-McGee Oil Industries Inc. have been moved to Oklahoma City, from Tulsa, Okla. This places all central offices of the company under one roof in the newly expanded Kerr-McGee Building at Second and Robinson in Oklahoma City.

Sinclair Gets Mecom Interests

Sinclair Oil & Gas Co. has purchased most of John W. Mecomis oil-producing properties in the Hull-Merchant area of Liberty, County, Texas, Gulf Coast.

Gas Reserves in Italy

Denying a decline in natural-gas finding rate in Italy, Enrico Mattei, president of ENI, during the 3rd International Hydrocarbons Convention said that natural-gas production in the country will reach in 1960 six billion of cubic meters, against about five billion produced last year. The new discoveries, according to Mattei, sustain a production at that level for 20 years. The estimate is very similar to that released last year by J. Baur, director of the oil department of OEEC.

Petrosud Finds Gas

A show of natural gas was found at 2,700 ft in Cellino Attanasio, in the Vomano Valley, 20 miles southeast of Teramo, in the Abruzzi province, by Societa Petrosud, now an affiliate only of Montecatini group, after the withdrawal of Gulf Italia from oil exploration in Italian mainland. The gas was blown up at "very strong" presure.

Siberian Oil Refinery

Construction has begun on a USSR oil refinery in Krasnoyarsk, on Yenisey River, to supply Siberian industrial centers of Norilsk and Igarka, 1,055 miles downstream.

Pipelines for Czechoslovakia

A 595-mile crude line and a gas line from Czech-Soviet border to western Bohemia is to start in 1960 for 1962-63 completion.

Chinese Aviation Plant

Chinese Petroleum Corp. has awarded Badger Manufacturing Co. a contract for the design, engineering, and equipment supply of a sulfuric acid alkylation plant to be erected at Kaohsiung, Taiwan, China. The plant will produce 600 b/d of aviation alkylate initially, with ultimate future capacity up to 1,000 b/d, and will greatly increase the production on Taiwan of 100/130 and 115/145 octane aviation gasoline.

The new plant, scheluled for completion in early 1959, will utilize a process licensed by Texaco Development Corp. which employs a Stratco contactor and provides for extensive fractionation of the alkylate.

Egypt's Oil Up

The output of crude oil from Egyptian oil fields amounted to 62,783 b/d in July 1958, the Ministry of Industry, United Arab Republic, reported in a statistical report. This brought the total output of crude oil from January 1, 1958, to July 31, 1958, to 1,863,166 cubic meters (55,368 b/d).

Refinery Compressor Standard

API Tentative Standard 617: Specification for Centrifugal Compressors for General Refinery Services, has been published. This is the first edition, June 1958. Specification covers minimum requirements for basic design, materials, inspection, and tests for centrifugal compressors used in refinery services handling air or gas, but excludes machines developing less than 5 psi; motor, steam or gas turbine, and engine-driven compressors, and related lube-oil and shaft-sealing systems, controls, auxiliary equipment, and gear units.

Orders should be directed to Publications Department, American Petroleum Institute, 50 West 50th Street, New York 20, N. Y.; $1.50 per copy.

Tanker Casualty Report Available

Westinform Shipping Report No. 114 deals with casualties to ocean-going tankers in 1957. All casualties involving tankers of 4,000 tons gross and over have been included. Copies of the report are available from W. G. Weston Ltd., 47 Piccadilly, London W.L., at £2 each (airmail postage outside Europe extra).

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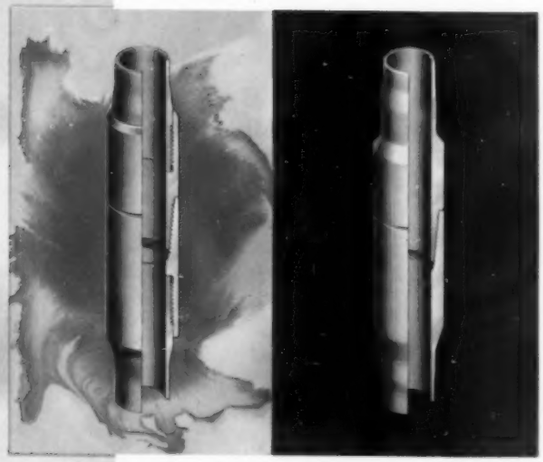

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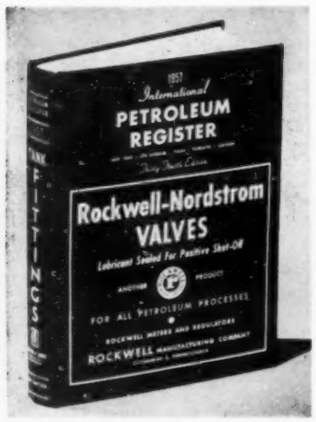

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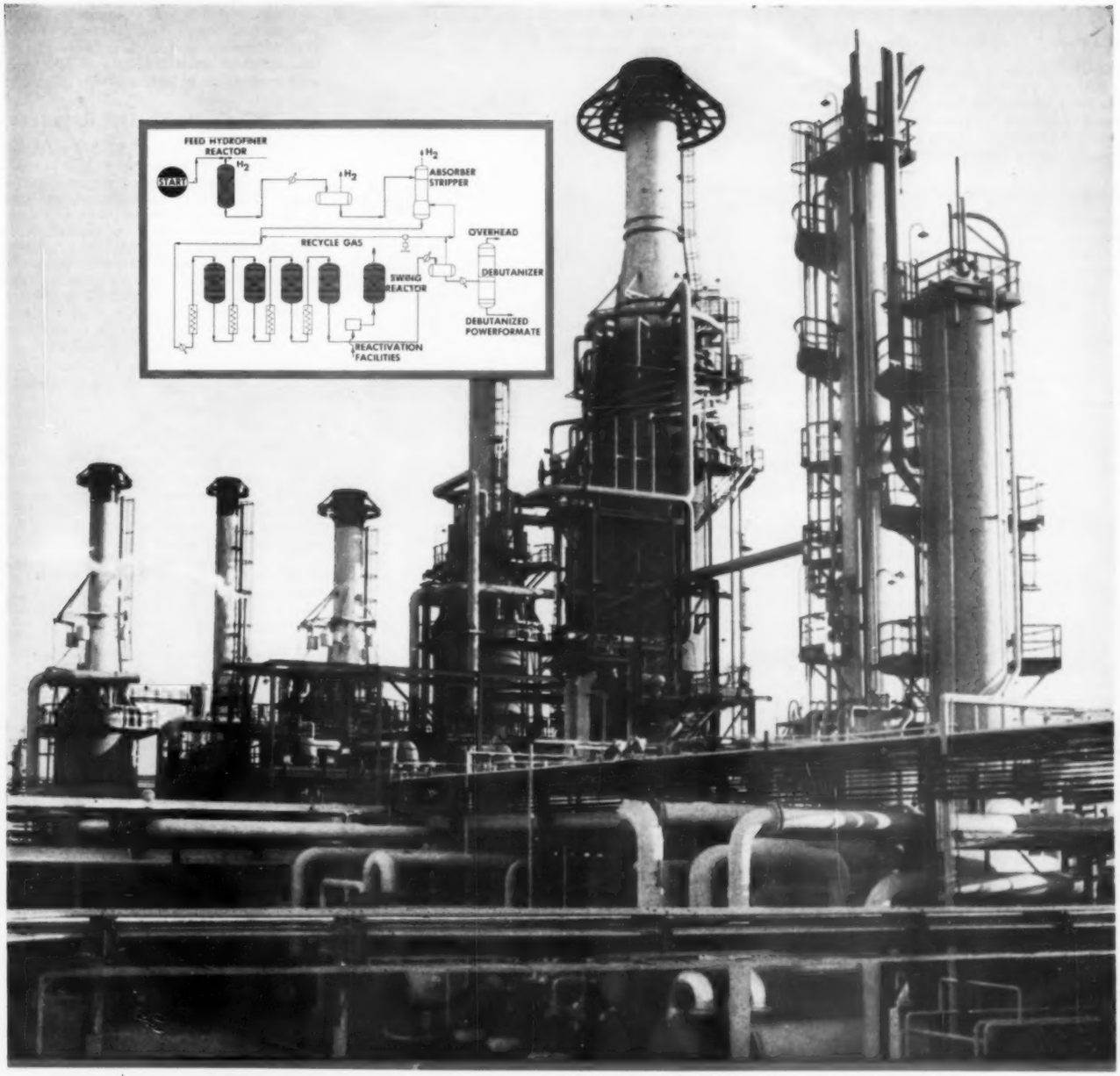

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CANADIAN NOTES

Canada's Largest Gas Producer

Unofficial open-flow potential of British American-Shell Berland River gas discovery, northwestern Alberta foothills, is 1,500 mmcf per day. Devonian D3 zone strike, which set record 551-ft net-pay zone thickness for Canada, is largest producer in history, and may be one of world's largest gas wells.

Canadian Natural-Gas Cycling

Contracts are being negotiated by Canadian Fina Oil Ltd. for a large natural-gas cycling plant and related facilities at Windfall in west-central Alberta. Long-range project, if pilot is successful, will make total investment of $83.5 million for Fina, Hudson's Bay, and Pan American in Windfall-Pine Creek-Beaver Creek area. Gas market, at present, is nonexistent, but byproducts may be saleable.

Canadian Offshore Drilling

Under-water drilling programs offshore in Lake Erie, east of St. Clair River, will be accelerated in remaining 1958 season before freeze-up. High-speed rotary-drilling equipment has almost completely replaced cable tools, permitting much faster well completions and bigger drilling schedule.

$25 Billion for Oil Canada

An analyst for Shell Oil Co. of Canada Ltd., Hans Maciej, addressing the Northwest International Oil Scouts annual meeting in Regina on September 13, stated that Canada's crude and natural-gas liquids reserves have grown from only 72 million barrels at the end of 1946 to 3,300 million, or 3.3 billion barrels —up approximately 45 times. Proved gas reserves amounted to 21 trillion cubic feet at the end of last year as compared with some 5 trillion cubic feet at the beginning of 1947.

He stated: "Although, seen in a world-wide frame, our present reserves represent only 1.3% of the proved reserves in the world today, results and data of the past decade's exploration and development in this country give us reason to believe that at least *one-fifth of the ultimate North American oil reserves* and at least one-quarter of the gas reserves will be found in Canada. This, of course, does not include the famous Athabasca tar sands . . ."

Exploration and development expenditure, noted Mr. Maciej, have increased from $150,000 daily in 1947 to $1.5 million daily at the present time. Regarding overall expenditures for the job ahead, he referred to the Gordon commission's estimate that some $25 billion will be required by the petroleum industry up to 1980. "It appears reasonable to estimate that at least 1/3 of that amount will be spent by 1968," said the analyst.

Alberta Story

Dynamic Decade, new book, unfolds the profound and extensive changes to Alberta's economy since the famous oil discovery at Leduc in 1946. It traces also the far-reaching consequences for all of Canada created by the oil development. From a "have-not" province, Alberta has become one of the wealthiest parts of the country, with revenues derived from the expanding oil industry. Foreign investment in Canada's natural resources has helped to make the Canadian dollar one of the world's hardest currencies, while oil itself has become a Canadian export.

Dynamic Decade has been published by McClelland and Stewart, and is available from local stationers in Calgary.

Trans Mountain Throughput Down

September throughput of Trans Mountain pipeline was estimated at only 60,000 b/d; third-quarter was estimated to average 74,000 b/d.

Many Island Gas Flows

Natural gas from the Many Island field in southeastern Alberta made its initial entry during September into the transmission system of the Saskatchewan Power Corp. Out of their total reserves of 660 billion cubic feet, Britalta and Crescent will deliver 210 billion to the SPC over a period of 20 years. First-year deliveries of three billion cubic feet will increase annually under terms of the contract to a peak of 17 billion. During the first year, SPC will pay 10¢ per mcf. The way has been paved for new price negotiations every three years.

BP's New Canadian Refinery

BP Canada Ltd. will build a refinery to sell products on the Canadian market under the BP trademark, the group's first entry into marketing and refining in North America. Work has begun on the Montreal refinery which is situated in Ville d'Anjou, approximately three miles from the St. Lawrence River. It will process 25,000 b/d initially, but will be laid out in such a way as to permit future expansion to double that of the original capacity. The refinery is designed, engineered, and constructed by The Lummus Co. Canada Ltd. Shown is construction of the concrete bund for the new oil-tanker jetties. The St. Lawrence River is seen in background.

Interprovincial Job Complete

The final weld in a second crude-oil pipeline extending from Edmonton to Superior, Wis., has been completed, according to R. E. Trammell, general manager of Interprovincial Pipe Line Co. and Lakehead Pipe Line Co. Inc. The Interprovincial-Lakehead pipeline system now consists of two parallel lines between Edmonton and Superior and a single line from Superior to Port Credit, Ontario.

Pumping stations at Regina, Glenavon, Cromer, and Glenboro are being expanded by the addition of another pumping unit to handle the added capacity of the two-line system. When this work is completed, the estimated capacity of the Interprovincial Pipe Line will be 275,000 b/d out of Edmonton and 376,000 b/d out of Cromer, and 258,000 b/d from Superior.

Personals

REX DAWSON has been elected executive vice president and general manager of Siebens Leaseholds Ltd., Calgary-based oil land company. William J. McKinley remains as vice president and manager of the land department; Douglas McPhee as secretary and office manager.

R. W. CAMPBELL has been named general manager-production and pipelines for Home Oil Co. Ltd., Calgary. Formerly he was vice president and general manager of company's subsidiary Federated Pipe Lines Ltd. **M. C. GOVIER**, former comptroller, has been made secretary-treasurer. **JOHN CARR** becomes chief geologist; **M. P. PAULSON**, operations manager and chief engineer; **J. H. HAMILTON**, assistant operations manager; **W. LUNDBERG**, production superintendent; **A. MORISON**, chief petroleum engineer; **ROSS PHILLIPS**, comptroller and accountant; **IAN DRUM**, manager of special projects.

B. C. GRINEAU, whose former positions included those of secretary-treasurer, Merrill Petroleums Ltd., and chief economist, Pacific Petroleums Ltd., has received appointment as treasurer of Canadian Export Gas Ltd., Calgary.

Alberta Suspends Dividends

Alberta's program under which citizens have been paid oil and gas royalty dividends amounting to a total of about $10 million per year will be suspended at the end of this year's payments. Period of suspension will run at least five years to allow diversion of money to special public-welfare projects. The dividend act will remain on statute books for easy resumption of payments when desired.

B-A's Moose Jaw Refinery

Construction of a new 5,400 b/d catalytic reforming unit at British American Oil's Moose Jaw refinery was scheduled for completion October 1. This is the sixth catalytic reformer to be built by the company in the past three years. The unit will not increase the total capacity of the refinery, but will upgrade gasoline already being produced. The Lummus Co. of Canada Ltd. were major contractors on this project, building both the naphtha desulfurizer and catalytic reformer. The gasoline splitter was constructed by Procon (Canada) Ltd. Extensive tankage and piping facilities, also added to the refinery, were designed by B-A engineers.

Oil Industry Reviewed

Petroleum—Prehistoric to Petrochemicals, by G. A. Purdy, consulting engineer, research chemist, and technical information specialist with Imperial Oil Ltd.; 500 pages, illustrated; McGraw-Hill; $15.

Account of the petroleum and petrochemical industries from geological to present-day products. Intended to meet the need for an authoritative, standard reference on the technology and products of petroleum, to appeal to the nontechnical as well as the petroleum expert reader. It describes and shows the nature of petroleum; how it is found, produced, and transported; processes used to convert it into products; and the products themselves and their uses.

Technical Information Center

Foreign Technical Information Center is now operating in the US Department of Commerce to provide American science and industry with access to translations of a large amount of Soviet technical information.

The services of the Foreign Technical Information Center include publication of abstracts of all articles appearing in 141 Soviet technical journals, translations of important sections of *Referativnyy Zhurnal* (the Russians' own abstract journal), and a semimonthly review of various areas of Soviet science compiled by the Central Intelligence Agency. Abstracts of each issue of the 141 journals may be purchased from OTS on a subscription or single-issue basis, as may CIA's *Scientific Information Report*. The various sections of *Referativnyy Zhurnal* will be sold initially by single isues, but subscription sales may be offered later.

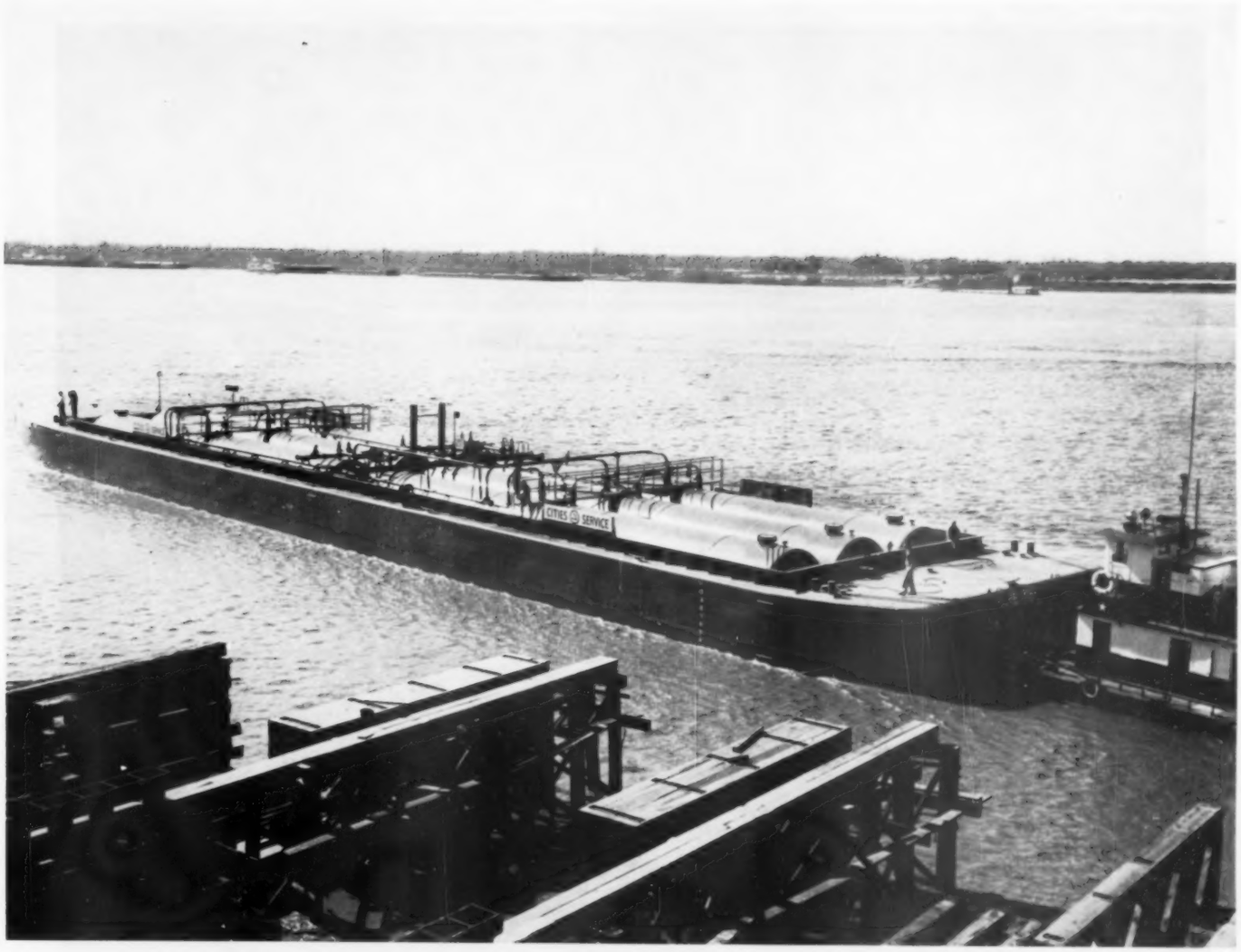
Congress appropriated $510,000 for the operation of the foreign technical information program in fiscal 1959. Functions of the program are to collect, catalog, print, and sell abstracts and complete translations of foreign technical documents.

Plastics and Coatings Catalogs

Five *Catalogs of Technical Reports* have just been published by the Office of Technical Services, US Department of Commerce. The CTR's list all research reports available from the OTS collection in the fields of molded plastics, polystyrene, zirconium, anodic coatings, and greases and lubricants. The CTR's may be ordered from OTS, US Department of Commerce, Washington 25, at 10 cents each. They are CTR-347 *Molded Plastics*, 1938-58; CTR-346 *Polystyrene*, 1930-58; CTR-344 *Zirconium*, 1932-58; CTR-348 *Anodic Coatings*, 1934-58; and CTR-345 *Greases and Lubricants*, 1939-58.

Fluid Flow and Heat Transfer

FLUID DYNAMICS AND HEAT TRANSFER, by James C. Knudsen, professor of chemical engineering at Oregon State College, and Donald L. Katz, chairman, department of chemical and metallurgical engineering, University of Michigan, has been published by McGraw-Hill Book Co., New York; 576 pages; $12.50.



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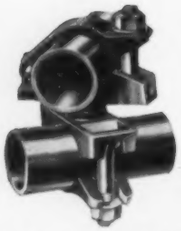

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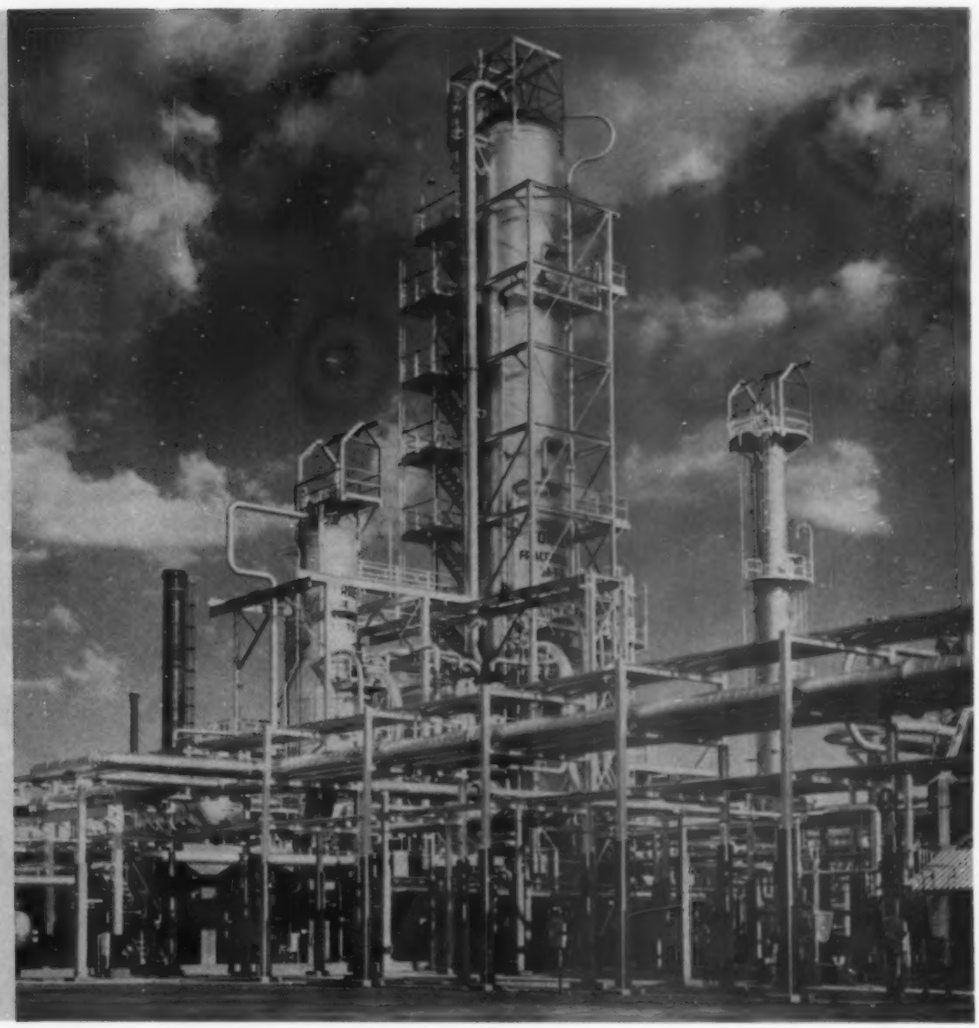

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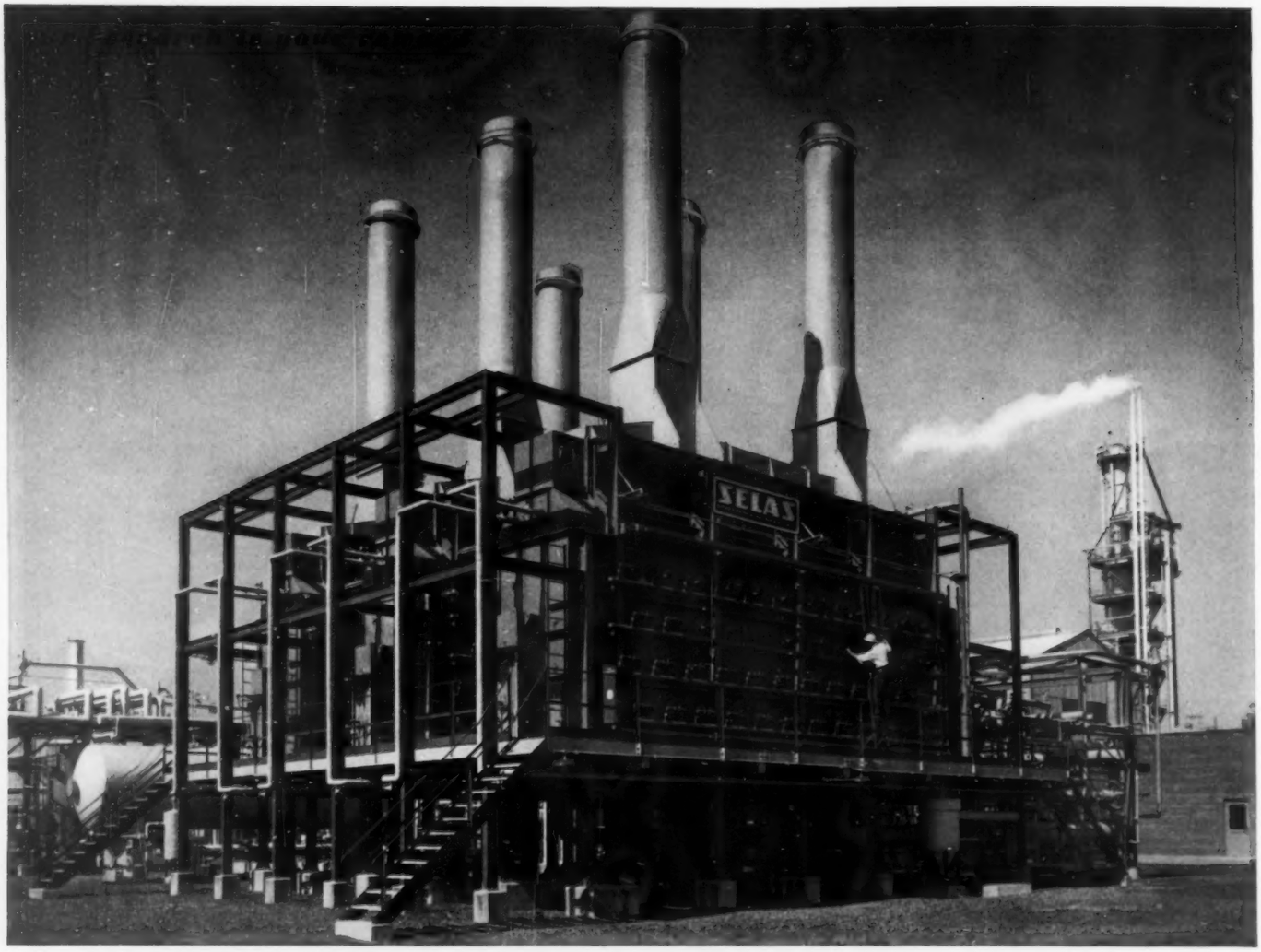

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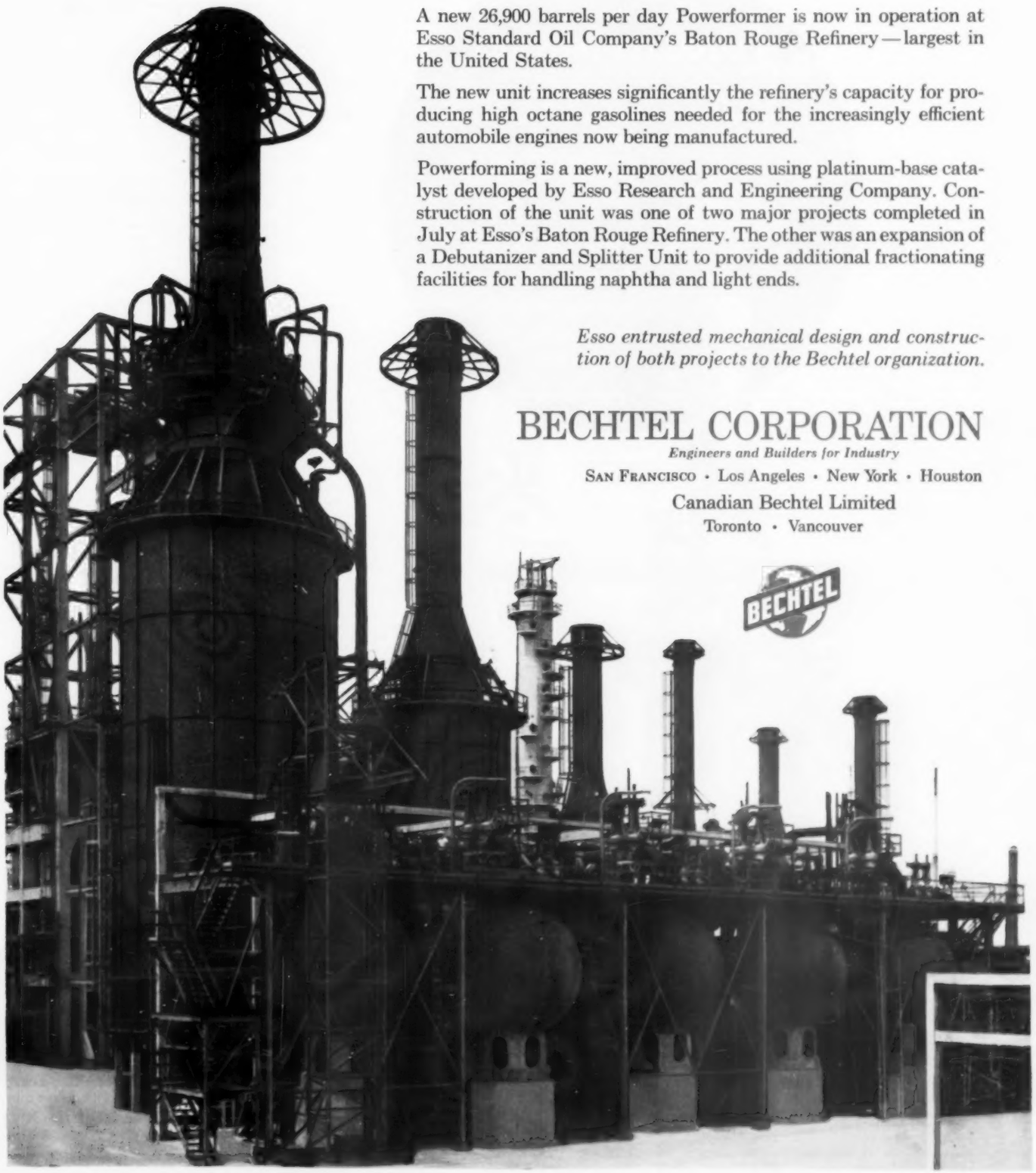

A new 26,900 barrels per day Powerformer is now in operation at Esso Standard Oil Company's Baton Rouge Refinery — largest in the United States.

The new unit increases significantly the refinery's capacity for producing high octane gasolines needed for the increasingly efficient automobile engines now being manufactured.

Powerforming is a new, improved process using platinum-base catalyst developed by Esso Research and Engineering Company. Construction of the unit was one of two major projects completed in July at Esso's Baton Rouge Refinery. The other was an expansion of a Debutanizer and Splitter Unit to provide additional fractionating facilities for handling naphtha and light ends.

Esso entrusted mechanical design and construction of both projects to the Bechtel organization.

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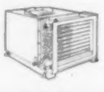

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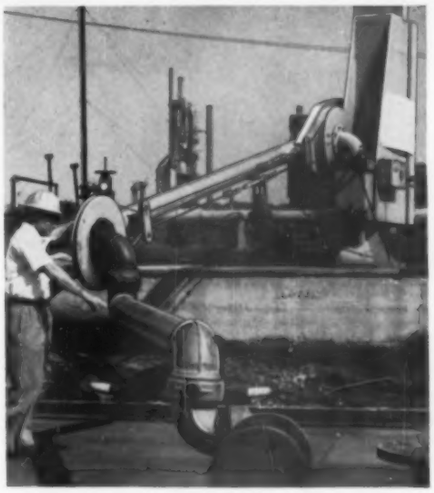
6″ x 25′ and 8″ x 28′ sizes available. Handle petroleum products, both black and bright, and mild caustics in any temperature ranging between —60° F. to +225° F. Service all river and lake barges and lake tankers including those in 25,000 barrel class.



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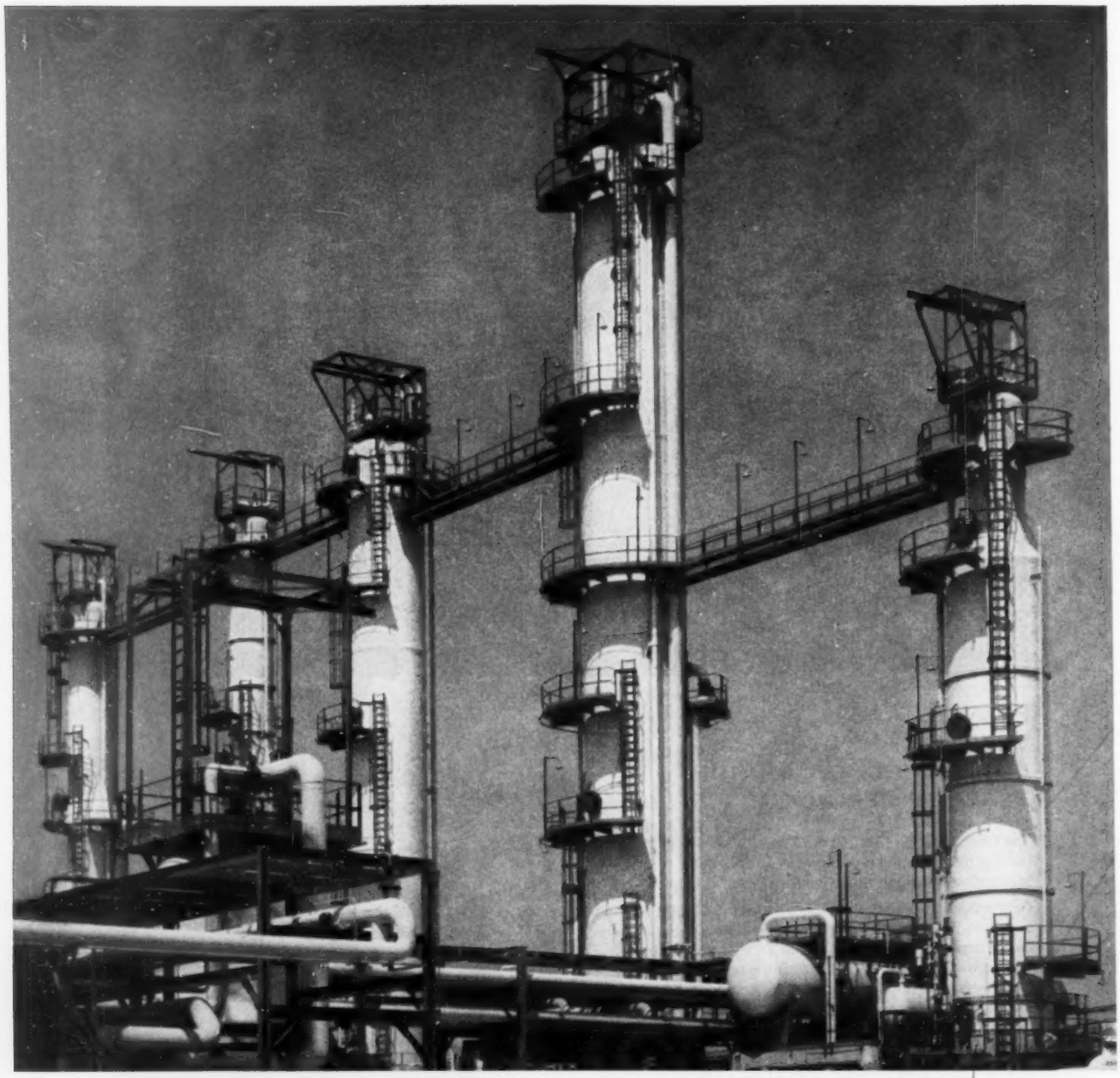

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The third of three new 26,000 b/d Platforming® units to be installed by the Gulf Oil Corporation is now on stream at Gulf's Port Arthur refinery. Built under license from the Universal Oil Products Company, this latest installation will substantially increase the high octane potential at the refinery.

The five large columns above and two separator units were shop-fabricated at Graver's East Chicago plant and erected by Procon Incorporated, the general contractor. Eighteen columns for the other two Platforming unit installations at Gulf's Philadelphia refinery were also shop-fabricated at Graver's East Chicago plant.

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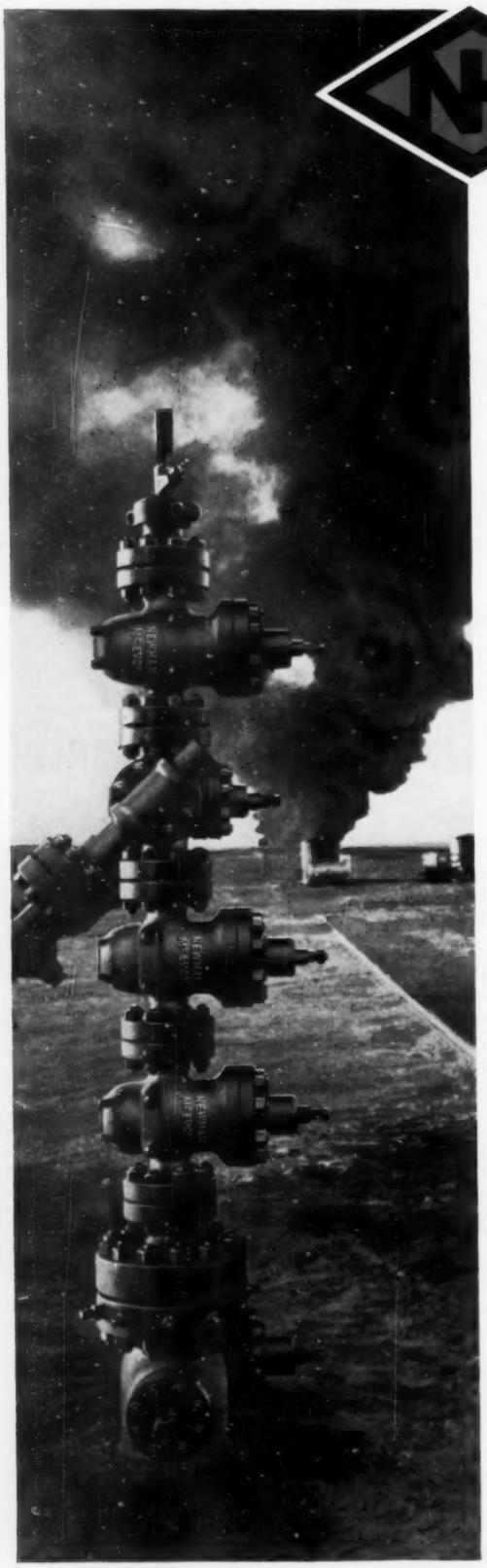

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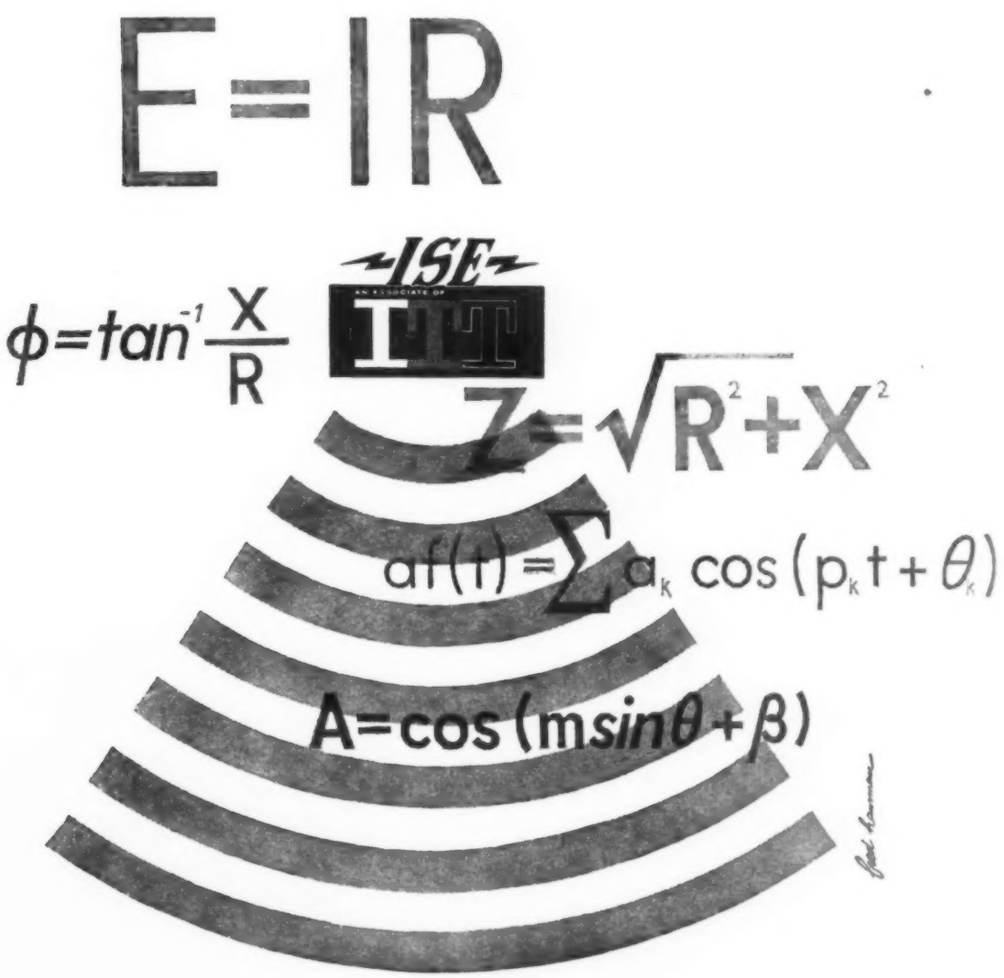

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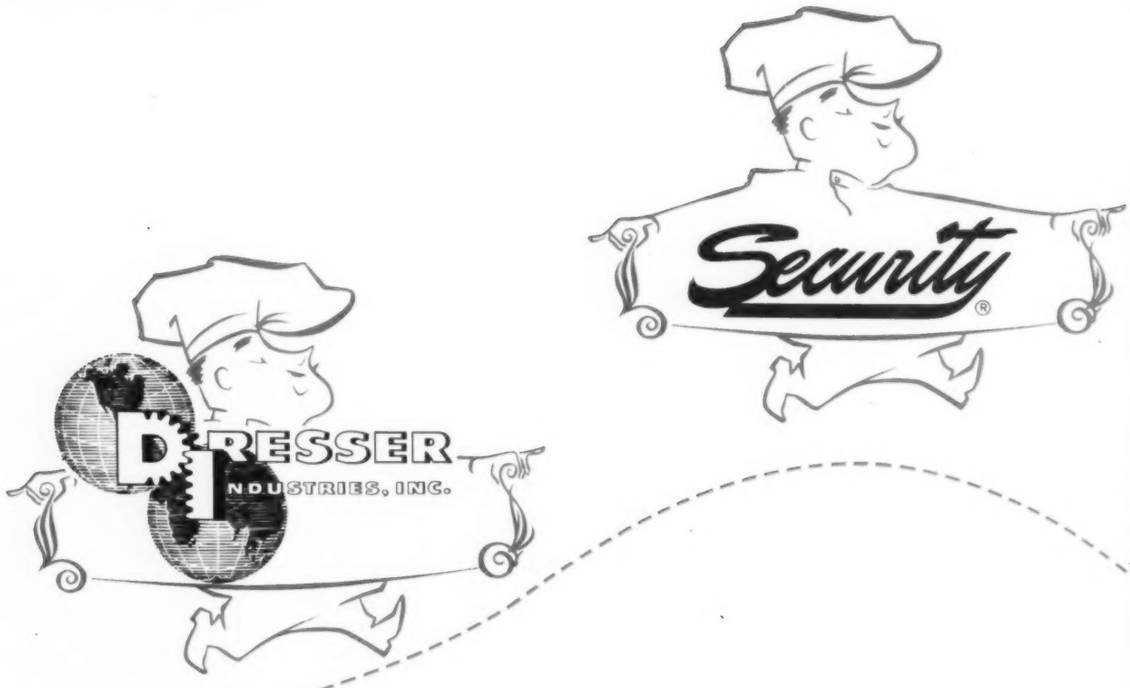

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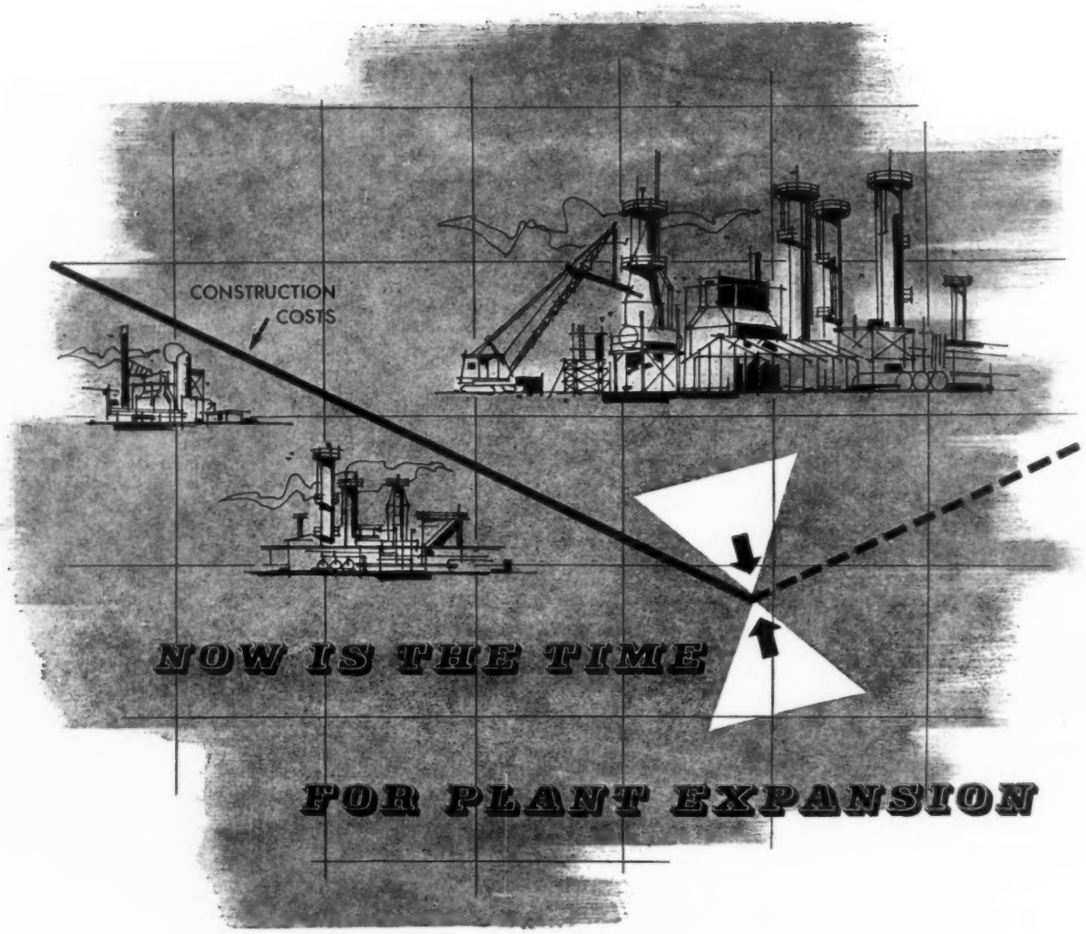

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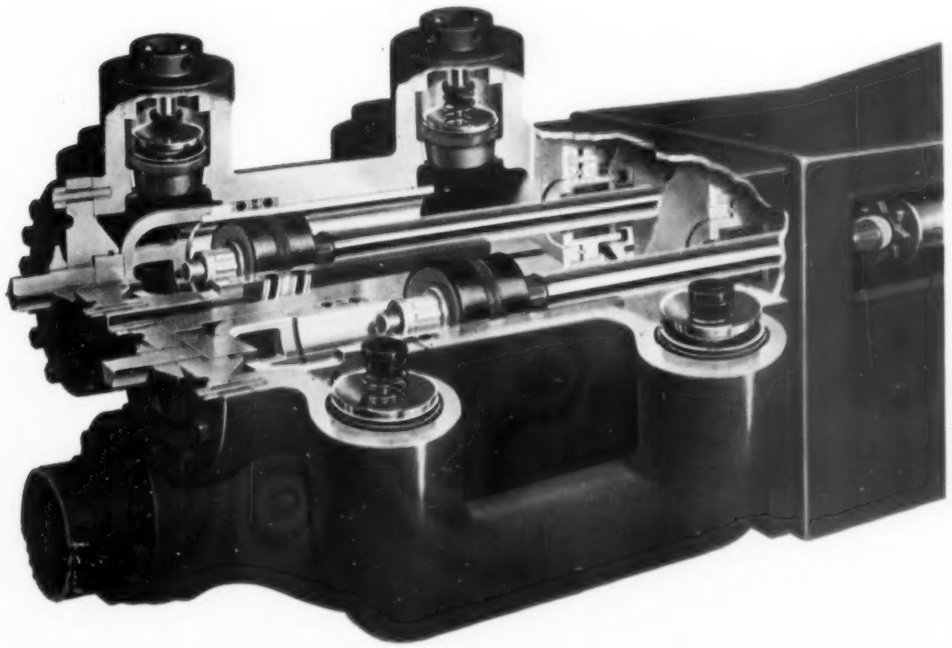

This cutaway view of a mud pump shows where the vital Mission fluid-end parts fit and why they are essential to correct operation. Forces on these parts are staggering. For example, pistons and rods may be subjected to forces of more than 100,000 pounds.

Liner packing and gland packing may be exposed to pressures exceeding 2000 psi, and valves and seats are required to stand violent impact every time they close.

Liners, also, are subject to "rocking," which aggravates both piston and liner packing wear unless all critical liner dimensions are held within API specifications.

These forces may be multiplied by shock loading at times, and they are completely reversed at least once every second. When you remember that mud may contain abrasive sand to cut metal parts, corrosive chemicals to pit them, and oil to attack rubber, it seems obvious that only the best pump parts stand a chance.

These Mission Pump Parts are in direct working contact with the drilling fluid, so it is easy to see that they are vital to correct pump operation. When you remember that they work together for trouble-free service, it makes sense to specify *all* Mission Pump Parts—exclusively—in all your pumps. Your pumps will perform better, require fewer repairs and cost less to maintain when you do. The famous Mission Guarantee assures you of this service.

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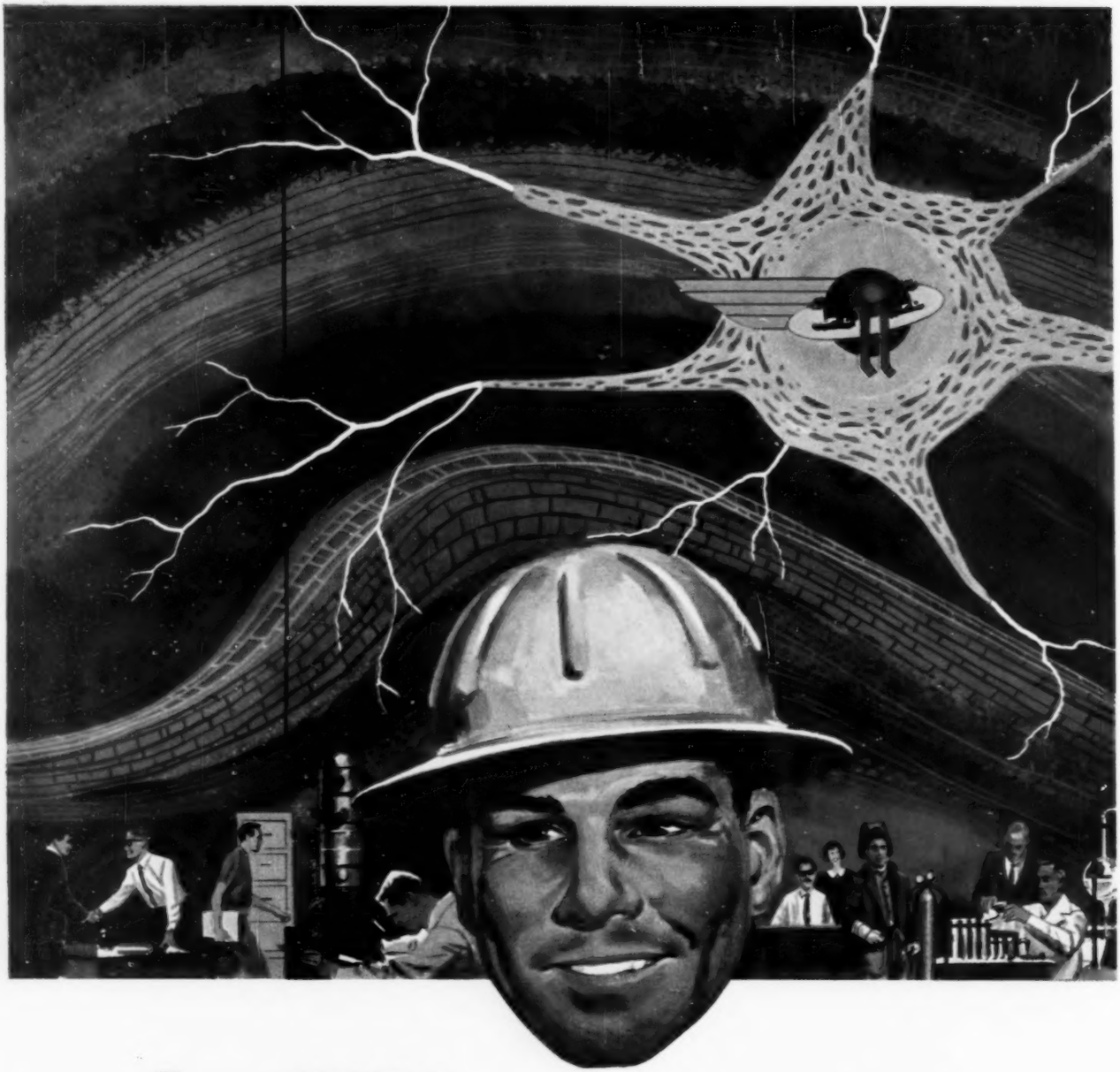

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HENRY STUART MACKENZIE BURNS, president of Shell Oil Co., is a husky, ruddy-complexioned Scotsman who is known as "Max" by his friends. After a tour of duty as second lieutenant in the Royal Artillery during World War I, he went to the University of Aberdeen, and later to Cambridge.

After graduation, Mr. Burns went to work for Shell in California as a geophysicist. Having a yen for the commercial side of business, he requested a transfer to the marketing department. With 10 years' experience behind him, he moved to Venezuela as second in charge of Shell's activities in that country. Shortly thereafter he was sent to Colombia as general manager, and there he spent the next 10 years.

In 1946 Mr. Burns returned to the United States as senior vice president of Shell Oil Co. Inc. He was elected president in June 1947. He was chairman of the Public-Relations Committee of the API Board of Directors for six years, and was elected chairman of the American Petroleum Institute in November 1957.

by H. S. M. Burns
Chairman, American Petroleum Institute

WE MUST SPEAK FOR OURSELVES

DURING the past year there has been considerable activity in examining and revamping the API public and governmental relations committees. As a result, the merger of the Oil Information Committee of the American Petroleum Institute and the American Petroleum Industries Committee, barely in the talking stage last year, is now an accomplished fact.

The changes, however, are far less sweeping than the casual observer might at first suspect. We still have the same problems facing us, and we propose to attack them by the same proven methods. All we have done is to provide a more streamlined organization to do a more effective job.

This new organization is a tool to help us with oil-industry public affairs. Like any other kind of tool, it will not do the job all by itself. It will take hard work and effort from all of us to make the new tool do its job. Solving the industry's public-affairs problems is no spectator sport; only by enlisting thousands of willing participants can we hope to succeed.

In case anyone expects the new Committee on Public Affairs to solve all our problems, we should face up before we start to the limitations and shortcomings of any committee effort in public or governmental relations.

There is an understandable tendency for people in oil or any other industry to sit back and relax once an organization has been set up and a budget approved—in the comfortable assurance that everything is taken care of. We must not delude ourselves on this score.

There will always be subjects on which an industry as a whole cannot agree. And no committee representing a variety of companies can be expected to act as promptly as an individual company in situations requiring promptness, such as answering untrue charges.

Information about prices, particularly price increases, has an important bearing on the oil industry's public and governmental relations. Yet, because of the legal restrictions arising from the antitrust laws, it is touchy business for any association to talk about prices except in the most general terms.

In a word, each of us is still his own best spokesman. We cannot reasonably expect an industry committee to speak up and say for us jointly things which we, as individual companies, are unwilling to say for ourselves. I have dwelt on some of the more obvious shortcomings of a joint public and governmental relations effort because I would hate to see the API's new Committee on Public Affairs start out life under the handicap of unrealistic expectations.

While each company is individually its own best spokesman, there are large areas where a joint effort in public and governmental relations is preferable. For instance, it is a definite advantage to speak as an industry, rather than as an individual competitor, in most matters involving governmental relations. This is because governmental bodies at all levels—local, state, and national—need assurance that they are listening to the views of at least a majority of a given industry.

The "united front" also seems to work best with matters such as educational materials, for schools sometimes regard as "commercial" the materials which have been prepared by individual companies.

In the collection and dissemination of facts and statistics about the whole industry, an industry group and not a private company will obviously be the more acceptable source. There are many other areas in both public and governmental relations where the considered opinion of the industry carries far more weight than the views of the individual companies. It is in these areas that I think the public and governmental endeavors of the Committee of Public Affairs can function to greatest effect—the same fields in which the OIC and the APIC have, in the past, done a good job.

The work of the various state PIC committees originated in the early 1930's. During the preceding

decade, every state had placed taxes on gasoline. But there was no consistency of purpose behind these taxes; in many states, there was not even adequate provision for collecting them. A first-class administrative muddle was in the making. To keep things from getting worse, oil men of several states organized gasoline-tax committees to help the states collect these taxes and, where necessary, to assist with drafting more adequate tax laws.

The American Petroleum Industries Committee was formally set up in 1932, a small office staff in New York to collect information and provide a legislative library service. APIC was from the first a coordinating rather than a directing agency; direction and financial support for the various state Petroleum Industry Committees was provided locally.

In a quarter century of existence, the Petroleum Industry Committees have acquired an enviable reputation for reliability and cooperation in their respective states. Because of their efforts and support in enacting properly drawn tax legislation, hundreds of millions of dollars in gasoline tax are each year collected and turned over to the states, without confusion or undue red tape. The PIC also has done the industry and the nation a real service in advocating a sound level of taxation and opposing taxation of gasoline for other than highway purposes. This advocacy of reasonable tax levels and opposition to diversion of tax funds has kept gasoline from being taxed out of the reach of the average man, as it has been in many European countries where gasoline has been taxed for general revenue purposes.

The Oil Information Committee has a shorter history, having been set up in the years immediately following World War II. Most oil people were then still basking in the glow of public approval arising out of the industry's outstanding job during the war. We could remember when only a few years earlier the industry had been subjected to constant attack and harassment in the press, legislative halls, and courts. Having enjoyed a taste of favorable public opinion, we were anxious to preserve this friendly climate, and in 1946 commissioned a public-opinion survey to find out just what people thought of us. The results were surprisingly good. The industry was rated rather high in nearly every department.

On two counts, this survey did uncover two things which might be called the genesis of unfavorable attitudes toward the oil industry. Significant numbers of people thought that oil was not particularly competitive and not particularly progressive in research and product improvement.

The next year an API public-relations program was set up, having as its general objective "to make clear how well the people of the United States are served by America's oil businesses, and to gain support for conditions under which they can continue to be privately managed, fully competitive, and financially sound." The public-relations committee, which soon became the OIC, set about correcting the two main misapprehensions uncovered in the 1946 survey. It emphasized the number and diversity of the concerns in the petroleum industry, and called frequent attention to the industry's progress in research and product improvement. That these efforts were successful may be concluded from our most recent survey. It showed widespread awareness of competition in the industry and of quality improvement in the industry's main product, gasoline.

The OIC also had a number of specialized programs of which we can all be proud. It developed a good program of school materials which receive wide use everywhere, and produced a good collection of motion pictures explaining our complex industry. Both these programs have found good acceptance, and are constantly being re-examined with an eye to improvement.

The objective of the new Committee on Public Affairs preserves the goal set for the OIC some 10 years ago:

"1. To stimulate the timely dissemination of information concerning the petroleum industry so that public opinion and decisions relating to it will be founded in fact.

"2. To develop a climate in which a privately managed and competitive petroleum industry can best serve the American people and strengthen the national economy.

"3. To encourage acceptance by all those engaged in the petroleum industry of their responsibility to assist government at all levels in matters of public interest affecting the industry of its customers."

Frank Porter said in his talk last May to the Rocky Mountain Oil and Gas Assn. that "we had a governmental relations program that made frequent use of public-relations methods, and a public-relations program which had, as its basic objectives, a governmental relations goal." Now we have the two programs combined.

At the state level, the merger of the OIC and PIC organizations has taken place. The various state organizations are recruiting their own manpower, raising their own funds, and providing their own direction. They have shown their independence of each other by drawing up their own constitutions and by-laws, determining their own organizational structure, and selecting names for their committees which follow no particular pattern. The Committee on Public Affairs' staff in New York will act, as the former APIC staff did, in an advisory and coordinating capacity. I think I should say, in passing, that this merger has not been carried out on the premise that "two can live as cheap as one." The object was solely to achieve more effective organization; I do not anticipate that the new setup will result in immediate monetary savings.

We all expect these revamped state organizations to work smoothly and effectively, developing and adapting programs suited to the particular circumstances of their own areas. I expect that this new measure of local autonomy in our public-relations efforts will bring about a greater degree of acquaintance between oil people and the public. This is highly important because it has been repeatedly demonstrated that people who know us well think well of us.

What lies ahead? In the years since OIC was created at the end of the war, new problems have developed. As we have seen, industry public-relations effort has been effective in cases where it took long-range aim at particular problems and then went to work on them. But while this was being done, a new set of problems has arisen.

The oil industry has grown at a tremendous pace since the end of World War II, with the result that most of us are doing three or four times the business we did in 1945. Earnings, keeping pace with this growth, gave many people the idea that oil companies make too much money. During the same period, prices of gasoline and fuel oil increased, in response to increased costs. These concurrent developments led, as might be expected, to outcries about "profiteering" and "price-gouging," which in turn brought investigations and attempts at restrictive legislation in many states. OIC has begun good work on the subject of profits and prices. I hope it will be continued by the new organization.

A second type of trouble is one we bring on ourselves. If we are to enjoy the rewards of a free business climate, we must be willing to endure the occasional discomforts. When people from one segment of the industry are confronted with temporary reverses and run to government officials to demand protection from, or revenge upon, other people in the same industry, they undo all the good that has been accomplished by our public and governmental relations programs. The chief result of their actions is to reinforce the suspicions and step up the activities of persons already unfriendly to the oil business. In a slack period such as we have recently been going through, we should realize that everyone in the industry is making less money and try to exercise self-restraint in calling for the cops. I hope it has not escaped notice that tough times in the market place affect everybody—the earnings of the major companies, for instance, were down an average of 40% in the first half of 1958.

A third set of problems in recent years must be put down mainly to bad luck. We are familiar enough with the vagaries of Lady Luck in the operation of our business, particularly the producing end of it. I think we should be a little bit better immunized against bad luck when it strikes in the field of public and governmental relations. Who could have foreseen that an honest attempt to obtain a fair restatement of Congress's original intent in the Natural Gas Act of 1938 would explode in our faces? Or that our earnest and best efforts to supply Europe in the Suez crisis would be so grossly misinterpreted as to lead to hostile press notices, investigations, and an antitrust suit charging conspiracy to fix prices? These are serious setbacks in a public-relations program. Certainly we must take steps to avoid their repetition.

The basic remedy for all our problems is not a single-shot cure but a constant, never-ending explanation of our complex business, an effort which needs the active and continuing support of every oil man. The old public-relations axiom "never underestimate a man's intelligence, nor overestimate his stock of information" was never more true than in connection with our industry. Repeatedly, we find that people are not as well informed about our business as we think they are. This is well illustrated by the frequency of investigations into what we consider the elementary aspects

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Operation "Whiffy"

API Research Project 48 (sulfur in petroleum), now celebrating its tenth birthday, is a prime example of the values obtained from the $7 million spent on fundamental research during the past 30 years under API direction.

SULFUR problems have been plaguing the petroleum industry for almost three-fourths of the near-100 years it has been in existence. Yet only in the past 10 years have oil's researchers, scientists, and other test-tube technicians accumulated anything resembling a working knowledge of this odoriferous chemical and its relationship to petroleum.

On one thing they agree unanimously: They know a lot more now than they did 10 years ago; but—and this is a very big "but"—there's still so much more to be learned They are fully aware the road ahead is not only rocky; it is studded with chemical mysteries which have to be unraveled and abstract problems which have to be solved or resolved.

The role of sulfur compounds in petroleum is a matter of pertinent interest, for it is going to be a talked-about topic when the American Petroleum Institute holds its 38th annual meeting in Chicago, Ill., November 10-12. And no doubt, "Whiffy" the Skunk will be in evidence aplenty too, for this notorious, white-striped creature has become the symbol of the work being done in this field.

The meeting dealing with sulfur compounds, known more ceremoniously as API Research Project 48, is not going to be one of the formalized group sessions. To the contrary, it will be a committee symposium, almost a background affair. But to this group, the men involved in Project 48 will make detailed reports commemorating the 10th "birthday" of the program. They will symbolize too, in many ways, the great work which is being done and the challenges which are being met by the Institute's multimillion-dollar fundamental research program. This is a long-term search for knowledge in the fields of pure science, and some of its projects already have histories dating back three decades.

Much whimsy and humor have been built into Project 48—more than is normally associated with long-hair studies. Because one of the major aspects of sulfur com-

MONROE E. SPAGHT, executive vice president of Shell; currently chairman of the API Board Committee on Fundamental Research.

Dr. ROBERT E. WILSON, former board chairman of Standard of Indiana, and for many years chairman of the API Board Committee on Fundamental Research. He was succeeded last January by Monroe E. Spaght, of Shell.

J. HOWARD PEW, retired president of Sun Oil Co., and former chairman of the API Board Committee on Fundamental Research for many years. He was succeeded by Dr. Robert E. Wilson, of Indiana Standard.

E.O. MATTOCKS, director of API Department of Technical Services and chief staff man on fundamental research activities.

FRED L. HARTLEY, chairman of the API Advisory Committee on Fundamental Research on Weather Forecasting.

ARTHUR L. LYMAN, chairman of the API Advisory Committee on the Composition and Properties of Petroleum.

JOHN E. SHERBORNE, chairman of the API Advisory Committee on Occurrence and Recovery of Petroleum.

pounds is and has been odor, the project people long ago began using the skunk as a symbol of their work. How and where the idea itself came into being is not clear, but "Whiffy" is about as close to life as it can be right now—and probably is better known, in many places, than the project personnel, and perhaps even the project itself.

"Whiffy" lives better than a real skunk ever could hope to, too. He has been "adopted" formally, has special "living quarters" in the laboratory area, and even makes field trips with some of the scientists.

This has proved to be disconcerting to quite a number of people, who looked up in restaurants and other places and found themselves staring at a man with a seeming real-life skunk nestling in his arms, in much the same way a kitten or a puppy is cuddled.

Since most people duck or shrink instinctively at face-to-face contact with this infamous animal—for obvious reasons—"Whiffy" has made many lose their aplomb, and sometimes their good manners, in attempts to get out of the so-called firing range. "Whiffy" looks real, but isn't. He is a stuffed specimen, contrived so cleverly that it is almost impossible to tell him from a live animal. Rare, indeed, is the person who isn't fooled completely for at least a few minutes, anyhow.

"Whiffy" normally is based at the Petroleum and Oil Shale Experiment Station operated by the US Bureau of Mines, at Laramie, Wyo. But since work on Project 48 also is conducted at the Petroleum Experiment Station at Bartlesville, Okla., another Bureau of Mines station, and at Northwestern University, Evanston, Ill., he makes his presence felt too. Although the work is handled by government employees and university personnel, it is sponsored and financed by the Institute, as part of its overall program of fundamental research on which it has invested more than $7 milliamm in the past 30 years.

When the Project 48 directors make their reports in Chicago this month, "Whiffy" will be the "star," for his personality and likeness have been captured and caricatured on a slide film illustrating the principal talk.

Among the reports to be presented will be those of John S. Ball and H. T. Rall, of the Laramie Station; John M. McCullough, of Bartlesville; Fred Bordwell, professor and head of the department of chemistry at Northwestern; and Dr. Carl E. Johnson, division director of the chemicals research division of Standard Oil Co. (Indiana), Chicago, who is chairman of Project 48 Advisory Committee. Members of Dr. Johnson's committee who'll no doubt be in attendance participating in the session also are Nelson Axe, Phillips Petroleum Co.; P. D. Ceasar, Socony Mobil Oil Co.; K. S. Cuddington, British Petroleum; Clark Egan, California Research Co.; W. E. Hanson, Gulf Oil Corp., temporarily asigned to the Mellon Institute; G. P. Hinds, Shell Oil Co.; G. R. Lake, Union Oil Co. of California; and J. C. Schiller, Humble Oil and Refining Co.

The work on Project 48 follows two basic lines: At Laramie and Bartlesville, high-purity samples are prepared, their physical and optical properties determined, their therodynamic properties studied, and techniques developed for the separation and identification of sulfur compounds. Hand in hand, at Northwestern University, is the second phase. There, laboratory methods of synthesis for the compounds needed in the analytical and separation work are developed, derivatives of the compounds are studied, and recommendations are made as to the best procedures for preparing the derivatives as well as the types best suited for identification purposes.

The significance of Project 48 is emphasized by the fact that high-sulfur crude is found in most of the oil-producing areas of the United States. Only the Appalachian and Gulf Coast regions are relatively free of the sulfur problem. Crude oils containing more than 2% are found in appreciable quantities in Mississippi, the Rocky Mountains, West Texas, the Mid Continent, and California. High-sulfur crude oils containing 0.5% sulfur or more make up more than half the production in California, the Rocky Mountains, West Texas, and Mississippi. It has been estimated that 38% of the crude output of the country as a whole has a sulfur content of 0.5% or higher. So, all in all, it's a very vexing problem.

But why is sulfur in petroleum a liability? Some of the bad effects of sulfur are disagreeable odor, color instability, corrosion, gum, varnish and sludge deposits, adverse effects on catalysts, and poor response to tetraethyl lead. Odor is listed first because, historically, it raised the first complaints. When kerosines containing sulfur compounds were used in lamps, undoubtedly there were marked—even violent—responses to the smell.

Similarly, it is not too much to speculate that the mercaptan content of gasoline may have been responsible, at least in part, for moving the gas tanks of automobiles from beneath the front seat to the extreme rear! Color instability isn't too much of a problem any more; but corrosion is a two-headed headache: Not only are hydrocarbon solutions of some sulfur compounds corrosive in themselves; but, when sulfur compounds are burned, sulfur dioxide and sulfur trioxide are formed which, upon contact with water, are extremely corrosive.

In recent years, as sulfur chemistry knowledge accumulated, it was found that sulfur compounds also contributed markedly to a number of adverse product-quality characteristics, and adverse burning characteristics of fuels. Still later, it was discovered that various sulfur compounds had depressing effects on the clear octane numbers of gasoline, and very pronounced effects—ranging from 3 to 15 octane numbers—on lowering the octane number of leading gasolines.

On the other hand, however, sulfur in

petroleum should not be condemned unequivocally as a nuisance. Some of the sulfur compounds present in petroleum can be, and are being, converted through various processing techniques to sulfur which, in turn, is converted to sulfuric acid for subsequent use in refining processes. Also, some sulfur compounds present in, or derivable from, petroleum—such as certain mercaptans and thiophenes—have uses in the preparation of chemical intermediates and antioxidants.

But what has been accomplished by Project 48? It has begun to fill the void which existed in sulfur chemistry prior to its initiation. It has already come up with data sheets, tables, and background analyses which have been invaluable to oil companies everywhere. It has identified 58 sulfur compounds in three crude oils, and it is anticipated this may top 60 by the end of this year. Some research experts feel that such progress has been made in the past decade that they could take any crude oil and within a reasonable time—perhaps a week or so—determine what sulfur compounds, boiling below 100 C, are in the crude oil, and how much of each is present. And, they feel further that they may be able to raise this temperature factor to 150 C before too long, despite the fact that they have not identified all of the sulfur compounds boiling below that temperature presently.

Project 48 is only one of the many special investigative studies which have been, and are being, conducted constantly by the Institute's imaginative fundamental research program. At the present time, there are 15 projects under way. Over the past 30 years, API has sponsored 71 individual research projects. Of these, 56 have been brought to successful conclusions. Of the 15 still under way, two were started in the first year of fundamental research work, way back in 1927; and it is the feeling of the savants that they will be around for many years to come. One of these is Project 6, dealing with the analysis, purification, and properties of petroleum hydrocarbons. It is being carried out at Carnegie Institute of Technology, under the immediate direction of Dr. F. D. Rossini. The other long-termer is Project 37, the fundamentals of hydrocarbon behavior, being pursued at the California Institute of Technology under the supervision of Dr. B. H. Sage and Dr. W. N. Lacey.

Other current projects, in addition to 48, 6, and 37, and their locale are as follows:

RP 42: Pennsylvania State University, synthesis and properties of high-molecular-weight hydrocarbons.

RP 44: Carnegie Institute of Technology, data on hydrocarbons and related compounds.

RP 45: Ohio State University Research Foundation, synthesis, purification, and properties of hydrocarbons of low molecular weight.

RP 47: Mechanism of the displacement of oil from porous materials; *47 D:* University of Texas, solid fluid interactions as related to petroleum production.

RP 51: Scripps Institution of Oceanography, University of California, study of near-shore Recent sediments and their environments in the Northern Gulf of Mexico.

RP 52: Nitrogen constituents in petroleum; *52-A:* University of Kansas, the chemistry of nitrogen compounds; *52-B:* Bureau of Mines, Laramie, Wyo., nitrogen compounds in petroleum; *52-C:* Bureau of Mines, Bartlesville, Okla., thermodynamics of nitrogen compounds.

RP 53: California Institute of Technology, geochemistry of uranium-lead system (age-dating).

RP 54: University of California, new spectroscopic techniques in hydrocarbon thermodynamics.

RP 55: Pennsylvania State University, hydrothermal and structural studies of minerals.

RP 57: Polytechnic Institute of Brooklyn, determination of surface areas of porous materials by light scattering.

RP 59: University of California at Los Angeles, theoretical and model studies of the scattering of seismic waves in the earth.

RP W-1: Traveler's Weather Research Center, determination of a method for long-range advance estimation of seasonal and monthly degree-days.

The fundamental research program follows three general lines: (1) the occurrence and recovery of petroleum; (2) the composition and properties of petroleum; and (3) weather forecasting. Advisory committees, composed of the best industry brains available, guide and direct these projects. Current chairmen of these advisory groups include J. E. Sherborne, a key research director for Union Oil Co. of California, occurrence and recovery of petroleum; A. L. Lyman, president of California Research Corp., composition and properties of petroleum; and F. L. Hartley, vice president, Union Oil Co. of California, weather forecasting.

The long-range weather project is one of the more recent undertakings. This is an area where legend and crystal balls are more prevalent than facts and knowledge. The nation's top meteorological authorities not only are keenly interested in the project; many are participating wholeheartedly. Long-range forecasting obviously would have much advantage not only for petroleum and its operations, but for all industries and the nation as a whole. The primary objective at the moment is to coordinate what factual information is available, and then look to the future and see what can be done to apply and extend this knowledge.

But getting back to committees again, the various advisory committees report to a high-level committee, composed of members of the API Board of Directors. This board committee currently is headed by Dr. M. E. Spaght, executive vice president of Shell Oil Co. Former chairmen included Dr. Robert E. Wilson, retired board chairman of Indiana Standard; and J. Howard Pew, retired president of Sun Oil Co. Chief

staff man is Elmer O. Mattocks, director of the API Department of Technical Services.

The API program is intended to furnish the scientific and technical information which companies can build on. Special effort is made to keep the research in the pure field, to stay away from anything which might even resemble product or commercial research—or research which might prove advantageous to any company or group of companies.

Dr. Spaght summarized it this way:

"If it were charged that the API research program has not done as well as it might because it has not produced any dramatic new products or manufacturing processes, or oil fields, the answer must be that, indeed, it has not done any of these things because it was not meant to.

"What is more, if the program had come up with any such results, it would have strayed wide of its course and, I venture to say, that in such a case the days of API fundamental research would be numbered.

"Its purpose is to broaden our foundation of basic knowledge about the materials we work with—nothing more. What we, as individual members serving individual companies, do with that information is up to us.

"The people who work at the various API research projects are, in effect, compiling a carefully selected and tested—and very precisely ordered—collection of facts. They are making a scientific dictionary. You do not criticize a dictionary because it is not the great American novel. You do recognize it as a major creative achievement in its own right. And you acknowledge the contribution it makes to work done by those who depend on it."

Dr. Spaght's words have more than usual significance when they are matched against the beginnings of API fundamental research. It is a going program now, but it wasn't always that way. In fact, the first attempt foundered on the rocks which the Shell vice president has cited.

Shortly after World War I, API took its first steps in the research field. Assembling a long list of scientists and engineers, it began to formulate a program for API sponsorship. The catch was that many of the recommendations were for projects with promise of immediate practical use. When they went before the API board, many members felt that the practical projects should continue on a competitive rather than a cooperative basis. The board refused therewith to permit or endorse the program.

It wasn't until 1926 that John D. Rockefeller Sr. and Universal Oil Products Co.

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Weather 3 years ahead

A physical basis for seasonal degree-day forecasts

Astonishing progress has been made in long-range weather forecasting techniques within the past five years. For the 1957-58 season, an accuracy of 86% has been attained in degree-day forecasts made ahead of the opening of the heating season. A vast library of data is being carded for computer use in developing forecasts by analogy.

by Irving P. Krick*

Photo courtesy SONJ

IN the petroleum industry one of the important factors in forecasting product requirements is weather. Many operations within the industry are affected by weather. These include exploration, producing, marine, pipeline, refining and, in particular, the petroleum products used each year for residential heating. More and more attention has been given by the industry in recent years to this latter item in view of its increasing importance. For example, industry fuel-oil sales for heating purposes increased to approximately 550 million barrels in 1956 from about 250 million in 1946. This growth rate is expected to continue for a number of years, with the weather-affected portion of it constantly increasing. It has been possible to develop a close relationship between heating-oil demand in various marketing areas of the USA and seasonal degree-day accumulations. These relationships, in turn, permit the economic assessment of this weather factor in petroleum-industry operations. Savings which might be put into effect on an industrywide basis, as well as an individual companywide basis, related to varying degrees of accuracy in predicting seasonal degree-day values, have been estimated by various members of the industry. Dr. M. J. Sweeney, in a paper entitled, "Importance and Need of Degree-Day Forecasting for the Petroleum Industry," at the 36th annual meeting of the American Petroleum Institute in Chicago in November 1956, indicates that even a 50% improvement in seasonal degree-day forecasts could result in industrywide annual savings of the order of $100 million. This conclusion is based on an estimate of tankage reduction costs of $40 million and a saving in capital tied up in inventory of $60 million, giving a total of $100 million.

The recognition of these economic values by improving weather forecasts has resulted in the establishment of an Advisory Committee on Fundamental Research on Weather Forecasting by the American Petroleum Institute. It has been estimated that, through an expenditure of the order of $25,000 or $50,000 a year for basic research in this field, large economic gains may be achieved.

A number of individual companies are also progressing investigations to improve forecasts of seasonal degree-days and their application. This paper reviews one investigation and the results obtained to date. The methods of forecasting utilized are described in some detail.

Some Aspects of Long-Range Weather Forecasting: Prior to the initiation of fundamental research on weather forecasting by the API advisory committee, a review of the prospects for reliability in long-range forecasting was presented by Dr. Hurd C. Willett, professor of meteorology, Massachusetts Institute of Technology, at the API meeting in Chicago referred to above. It is appropriate to review some of Professor Willett's remarks. An assessment of the reliability of prediction in terms of percentage of skill is discussed. The skill score is that percentage of the total variability of the forecast element which the forecast expresses over and above that which would be expressed by pure chance or uneducated guess. A simple example is the case where a forecast indicates whether the temperature next season will average above or below normal. A random guess, in the absence of a significant long-range trend, will be right 50% of the time and wrong 50% of the time. Thus, if a forecaster is right 75% of the time, he has forecast half of the total variability over and above pure guess work.

*Dr. IRVING P. KRICK, president of Irving P. Krick Associates Inc., Denver, has specialized in the development and application of long-range weather forecasting for industrial and military purposes since 1932. For 15 years prior to 1948, he had been chairman of the Department of Meteorology of California Institute of Technology. While holding this position, he served the Army and Navy in specialized weather work. In 1942, he was transferred from the Navy to the US Army Air Force as chief of long-range research and forecasting, with the rank of major. Later he was promoted to lieutenant-colonel and made deputy director of weather services in the European theatre, and still later chief of the weather-information section of the Strategic Air Service.

In recent years Dr. Krick has been acting as a consultant to industry while developing new forecasting techniques based on the theory that weather behavior is systematic and can be reduced to patterns suitable for punch-card coding and electronic computer processing.

What will your weather be?

WEATHER FORECASTS COVERING IMPORTANT MEETINGS IN THE PETROLEUM INDUSTRY DEC. 1, 1958 THROUGH FEB. 19, 1959

December 1-3, 1958—Interstate Oil Compact Commission—Kansas City, Mo., Weather Outlook: Stormy conditions are expected on December 3; otherwise fair weather should prevail.

December 2-4, 1958—Asphalt Institute—Washington, D. C., Weather Outlook: Cold temperatures are expected. Weather conditions will be briefly stormy around December 3.

December 5, 1958—American Socy. of Mechanical Engineers—New York City Weather Outlook: Partly cloudy and cool.

December 7-10, 1958—The American Institute—Cincinnati, Ohio, Weather Outlook: Unseasonably cold temperatures on the 9th and 10th. This cold weather will be preceded by a stormy pattern around December 7 or 8.

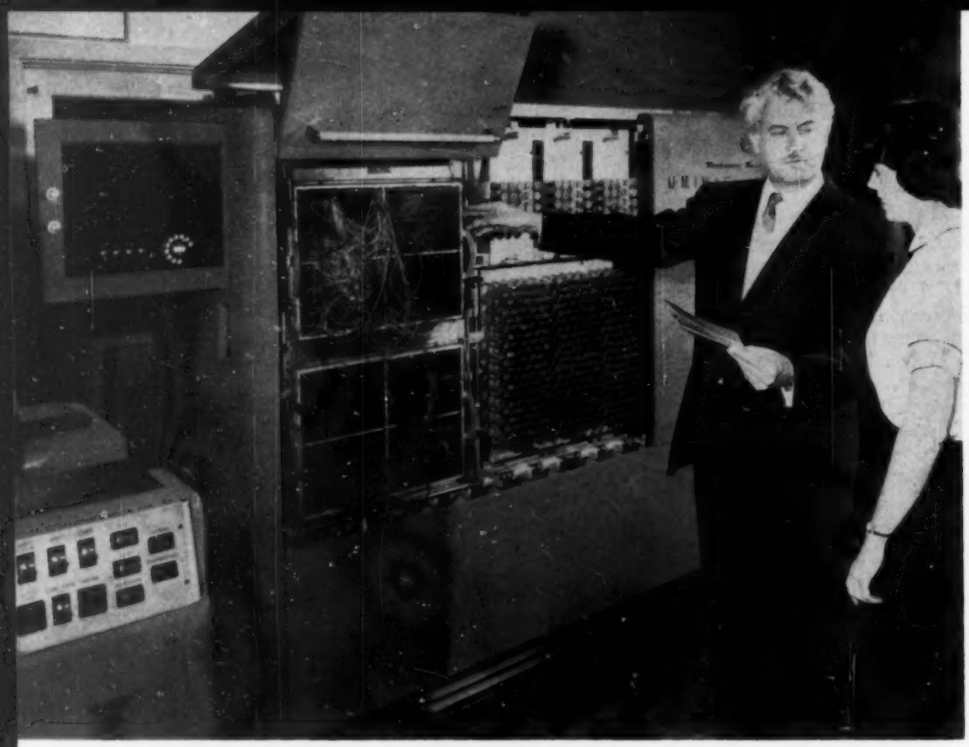
December 9-13, 1958—National Assn. of Corrosion Engineers—Chicago, Ill., Weather Outlook: Very cold weather is expected throughout this entire interval.

February 1-6, 1959—The American Socy. for Testing Materials—St. Louis, Mo., Weather Outlook: Important precipitation ending around February 1; however, storminess with important precipitation accumulations is again expected intermittently between February 4 and 6.

February 9-11, 1959—American Assn. of Petroleum Geologists—Albuquerque, N. Mex., Weather Outlook: Generally fair weather is expected, although unsettled conditions with a chance of minor storminess around February 11.

February 15-19, 1959—American Institute of Mining—San Francisco, Calif., Weather Outlook: Our advice is for all participants to bring their raincoats. Our forecast calls for an extended interval of rainy weather; at least four out of six of these days should have important rainfall accumulation.

February 16-19, 1959—American Assn. of Petroleum Geologists—Dallas, Texas, Weather Outlook: Quite mild during entire period. Chance of brief light showers on February 19.



Dr. Irving P. Krick explains the functions of the Remington Rand Univac computer in projecting atmospheric behavior far into the future. It does the work in 30 seconds which normally would take skilled technicians 1,000 hours to perform.

His skill score is then 50%, and reflects the required improvement suggested by Dr. Sweeney. Dr. Willett points out that his investigations, with one possible exception which required fuller verification, revealed that forecasts issued up to the time of his presentation, either by public or private agencies, revealed a skill of approximately 20%. Such forecasts would not be sufficiently better than making use of straight persistence, which projects the current weather departure in forecasting the upcoming period—a procedure which cannot be properly called forecasting, but rather the substitution of an educated guess for a random guess.

Dr. Willett goes on to review his opinions concerning possible improvement in skill scores through the application of various forecasting techniques, and concludes that a skill of approximately 70% or better may be attained within the next 20 years. This represents a rapid improvement over the skill scores achieved from investigations during the more than half a century of interest and effort put forth on the problem of long-range weather forecasting. In his opinion, this accelerated improvement will be a function of an increasing understanding of the dynamical aspects of the general circulation of the atmosphere, made possible because of increasing quantities of historical weather data for the Northern Hemisphere since World War II, and the utilization of high-speed electronic computers for the processing and storage of data.

Review of Seasonal and Annual Forecasts: Fig. 1 is an analysis and evaluation of seasonal degree-day forecasts prepared for an individual oil company during the 1957-58 heating season. The forecast was issued in December for the indicated forecast interval. Fig. 1 shows cumulative degree-day figures at five East Coast markets —Albany, Boston, New York, Baltimore, and Atlanta. These are the markets where the greatest number of oil burners are serviced by the client company and, therefore, those given the greatest weighting factors in assessing results of the nationwide experiment. It will be noted, in examining Fig. 1, that during the months of December, February, and April, when the deviations from normal were greatest, the forecast was closer to the actual. In summary, it will be noted that the seasonal weighted degree-day error was −11.8 degree-days. The difference between normal and actual was +84.3 degree-days. Thus, the forecast reflects a "use factor." It accounts for 86% of the spread between actual degree-day accumulations and normal.

A nationwide assessment of the forecast, using the weighted degree-day figures for each city pertinent to the client company's operation, was prepared by its statistical division, covering the period through March 28, 1958. The percentage error of the forecast from actual was over 1.4%. A weighted average on an industrywide basis was also computed, based upon the difference between actual degree-day values and normal. This was done for both the old industrywide basis and a new basis—presumably resulting from an adjustment in normal degree-day values and weighting factors for a number of cities. The industrywide percentage of error was given as over (old basis) 4.3%, and over 3.2% (new basis), respectively. These figures can be interpreted to mean that the season as a whole was warmer than the industry planned for on the basis of normal weather by 4.3% or 3.2%, respectively. The client company's estimate was 1.4% warmer on the basis of predicted weather.

It is estimated that approximately 15 million barrels less than anticipated were sold industrywide on the new basis for degree-day weighting, of which about 85% would be intermediate grades. The client company's error in forecasting its sales would be proportionately less. In a more extreme year, when temperature departures from normal are greater, these relative values become more significant. On the other hand, the average this past year was particularly important because it came during a business recession.

Fig. 2 is an analysis of an entirely different type of forecast, but one which ultimately may become vital to the petroleum industry. Because the bulk of electric energy produced in the Pacific Northwest is from water power, annual estimates of stream flow for the Columbia River and its tributaries become highly significant. In a low-water year, large amounts of power are steam-generated and, therefore, require high fuel-oil consumption. In more normal or abundant water years, little or no steam generation is required. Therefore, a dependable prediction of stream flow during such years will ultimately cause power producers in the area to minimize fuel-oil purchases. Conversely, a forecast of critical water conditions will increase them. Presently, purchases are hedged for the possible occurrence of low water, because firm power capabilities are estimated on this basis.

It will be seen from Fig. 2 that a "use factor" has been computed for a forecast for the Columbia River at Grand Coulee. The use factor reflects the value of the forecast as a positive measure of the difference between critical water and estimated water. The difference between the low-water year (1937) and the high-water year (1934) at Grand Coulee is quite large. Thus a reliable annual estimate of the difference between critical water and actual introduces valuable flexibilities into power-system operation.

Fig. 3 is an analysis of a 1956-57 seasonal degree-day forecast. It reflects a beginning in the application of the techniques described below, utilizing recent advances in our application of the dynamical treatment of atmospheric behavior, and incorporating data processing by electronic computers.

Evolution of the Dynamical Method of Long-Range Weather Forecasting: Dr. Willett points out in his paper the limitations of forecasting methods based upon a purely statistical approach or a physical-synoptic approach, and indicates the need for development of a dynamical approach to long-range forecasting in order to achieve skill scores fulfilling requirements of the petroleum industry. He estimated

that the attainment of this level of performance would require approximately 20 years. It would appear that skill scores approaching this level have been reached by our group. We attribute this fact to the consistent effort in this direction put forth by the author and his associates for some 25 years. During the past five years, with the resolution of certain basic theoretical problems, the introduction of machine techniques to handle data processing and the availability of a long historical archive of Northern Hemispheric weather charts, real progress has been achieved. Theoretical considerations, fundamental to our approach, have remained unchanged from their inception. Investigations on the possibilities of long-range forecasting were initiated at the California Institute of Technology in 1934, where the author and a number of his present associates directed the activities of the Department of Meteorology. At the outset, it was recognized that a dynamical approach to the problem of long-range weather forecasting would yield maximum utility in the final product. A search began for evidence of systematic behavior features in the planetary wind system, sometimes called the "general circulation of the atmosphere." It controls the ever-changing weather patterns. This line of attack was predicated upon the firm belief that nature is ordered and that the atmosphere is no exception. In the early phases of the work, the lack of a long series of daily weather charts covering the Northern Hemisphere imposed serious limitations on the program. Nevertheless, certain clues were found which revealed the inherent stability of various atmospheric circulation patterns and the repetitious nature of them. It was found possible to classify these into six-day sequential surface barometric-pressure patterns. These were called "weather types." It was our belief that the reality of such a general classification confirmed the ordered nature of atmospheric behavior and the fact that the wind systems, manifested in the pressure patterns, assume preferred positions in relation to not only the geographical features of the earth's surface, but also the terrestrial and extraterrestrial forces motivating the atmosphere.

During World War II, the US Air Force financed the preparation of an historical archive of surface Northern Hemispheric weather charts for each day from January 1, 1899, through 1939. This record has subsequently been maintained, and now provides the basic material for much of the effort being progressed on long-range weather forecasting in the United States, both by our organization and others. This archive of Northern Hemispheric charts was classified into broad weather types for various segments of the globe. This catalog provides a useful tool in forecasting, because full use can be made of historical weather sequences in preparing future weather estimates. This is done by matching current or projected weather maps with similar fragments of the historical record

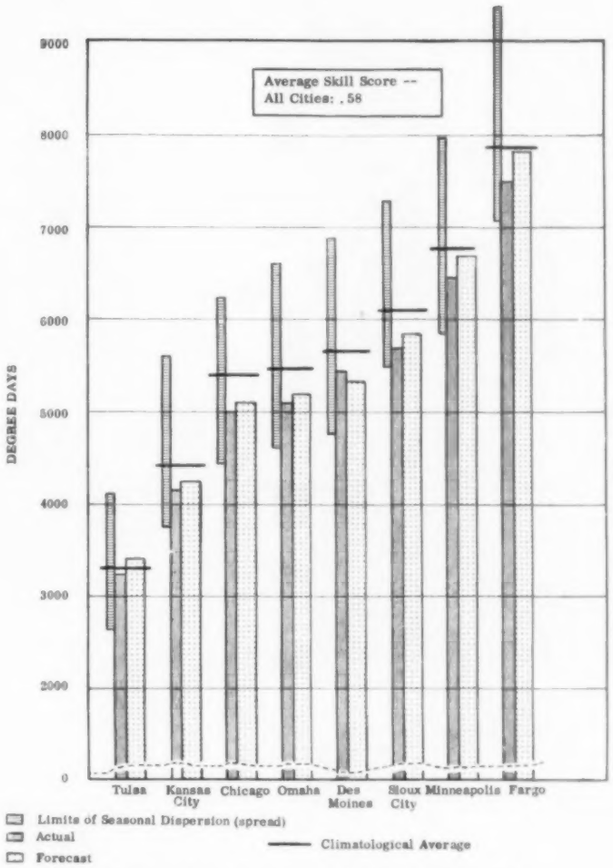


Fig. 3 Relationship of degree-day accumulation for eight cities with forecast covering the October 1956-March 1957 interval: The measure of possible limits is included along with the climatological averages.

to develop estimates of future weather behavior. Until recently it was not possible to use this "analog" approach effectively for forecasts beyond a week or so.

Over the years, it became increasingly apparent in our investigations that atmospheric behavior could be treated from the standpoint of wave theory. The moving high and low barometric-pressure areas on daily weather charts appeared to be surface manifestations of the undulating rivers of air moving from west to east in the planetary wind system. The crests of these waves appeared as high-pressure belts and the troughs as low-pressure areas. By 1953, the concept of introducing three-dimensional wave forms for describing any observed barometric-pressure pattern at the earth's surface was tried. It was found that all weather maps could be analyzed in terms of superimposed, globe-circling wave groups. Elements of these wave systems were subjected to mathematical analysis to reveal recurrent or systematic characteristics, thus permitting their projection into the future. Our original hypothesis, that atmospheric behavior must be systematic, was tested by such analyses and found to be valid. This discovery, the most exciting we had made to date, encouraged us to extend the entire procedure to high-speed electronic computers to perform the tedious mathematical computations involved. It required first the tremendous task of converting the barometric-pressure patterns on daily Northern Hemispheric charts to wave forms, suitable for coding on punch cards. By fall of 1956, 20 years of data for a grid extending from the East Pacific across North America was completed, and the processing of these data by machine was begun in order to determine predictable features.

These procedures permitted the extrapolation into the future of multitudinous wave patterns which could be integrated for each day to form a prognostic daily weather chart. Since each wave component had been analyzed individually, a tremendous number of machine solutions were required before a sufficient number of wave axes, to define each day's map, became available. As the number of problems handled by the machines increased, barometric-pressure patterns began to emerge for each day far into the future. Thus, our cumulative machine production continually adds to the definition and reliability of the prognoses.

The interpretation of the prognostic pressure charts yields weather information which is converted into cumulative degree-

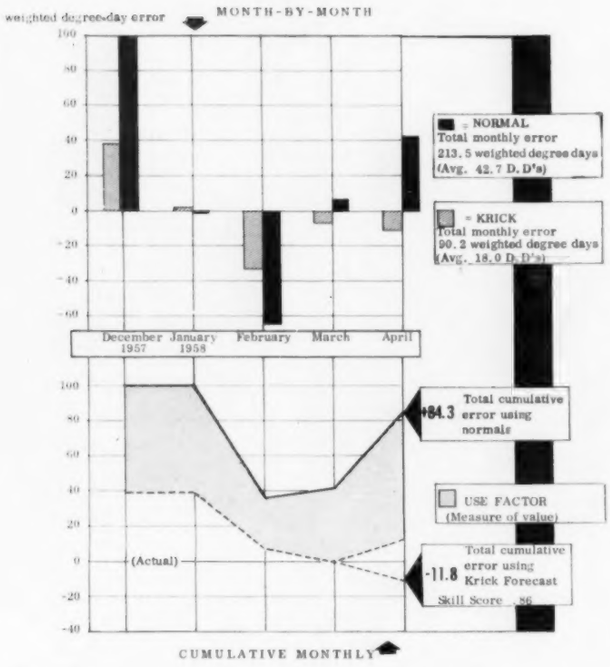


Fig. 1 Month-by-month and cumulative weighted degree-day performance (weighting factors established before season began by the client petroleum company referred to in this article): This chart shows the error in weighted degree-day estimates for Krick forecasts as compared to the use of normals, December 1957 through April 1958.

day values or other weather-related parameters acceptable to client companies. By synthesizing the forecast from matching segments of past history, which jibe with the projected pressure patterns, it has been found that tolerances are minimized. After the inherent variability in such forecasts has been determined, one may arrive at a completely dependable forecast level for degree-days, stream flow, or other parameters of operational significance. This is an important improvement over forecasts derived solely from statistical manipulations wherein the final result must be expressed in terms of probabilities. At the present time, daily barometric-pressure patterns for periods three years ahead have been confirmed without showing any deterioration in the quality of the prognosis. This is indicative of the fundamental nature of our discoveries. The fact that useful forecasts can be developed from the interpretation of this information would imply that both the terrestrial, as well as all extra-terrestrial effects—including solar-weather relationships—may be reflected in the recurring wave forms present in the atmosphere. Thus, not only has our atmosphere reached a relatively stable state of equilibrium, but presumably the sun's atmosphere and the entire solar system has attained such equilibrium and can be counted on to perform for countless years into the future without sudden shifts or radical deviations in behavior from those patterns of pressure and related weather observed in recent history.

TABLE I: BASIS FOR MEASURING UTILITY AND PERFORMANCE ALONG WITH EAST COAST AREA VERIFICATION FOR MONTHS DECEMBER, 1957—APRIL, 1958.

(Note: This table lists the data from which Fig. 1 was constructed.)

EXPLANATION: Certain weights were assigned to several cities for which client company received degree-day forecast values. Such weights were established by the client company and, in general, were based on the relative size of the client market penetration in each area.

Verification for the East Coast region (Boston, Albany, New York, Baltimore, and Atlanta) for the months December 1957-April 1958 is listed below:

	Dec.	Jan.	Feb.	Mar.	Apr.	Total
Forecast	476.1	607.3	583.1	437.3	216.0	2319.8
Actual	437.2	607.0	616.2	445.0	226.2	2331.6
Normal	537.4	606.8	551.8	451.0	268.9	2415.9
(Difference from actual)						
Krick Forecast	+ 38.9	+ 0.3	—33.1	— 7.7	—10.2	—11.8
Normal	+100.2	— 0.2	—64.4	+ 6.0	+42.7	+84.3
Total error disregarding signs (that is, absolute error)						
Krick Forecast	90.2	Total Seasonal Error				
Normal	213.5	Total Seasonal Error				
Cumulative error as the season pregressed						
	Dec.	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**Total**
Krick Forecast	38.9	39.2	6.1	— 1.6	—11.8	—11.8
Normal	100.2	100.0	35.6	41.6	84.3	84.3
Per cent improvement Krick Forecast yields when compared to use of weighted degree-day normals.	61.2%	60.8%	82.9%	96.2%	86.0%	86.0%

At present, the greater source of error is in the interpretation of the prognostic pressure maps to develop the weather they produce. Here an analog technique is utilized in which the prognostic charts are matched, partly by machine procedures, with comparable pressure sequences of the past. If a number of analogs are found, the mean value of the weather associated with them is used to describe the prognostic chart. A synthetis for each day of the forecast period is then prepared. From this the cumulative effects of weather for a season, or the highlights, can be determined.

Sources of Forecast Improvement: Improvements in forecasting skill will be achieved when the entire hemispheric archive of about 60 years has been analyzed and prepared for machine manipulation. This task is now under way. Another important task is to tabulate and store for machine use daily weather data in various categories. This ultimately will permit the transformation of prognostic pressure maps to weather by selecting and tabulating analogs by machine.

It is estimated that, when these tasks have been completed, forecasting skills of 80% or 90% can be achieved consistently for forecast intervals of several years or more. The time required for their completion will be inversely proportional to the financing which can be made available for it.

Conclusion: A threshold in long-range weather forecasting, reflecting use factors of economic value, has been attained after 25 years of continuous effort directed at the

Sources of Forecast Error: It is not contemplated that perfection will be attained in forecasts of this nature because of inherent sources of error in the data and their processing. The forecasts will be just as good as the raw data punched into the cards and the interpretation of the final pressure-pattern charts. The initial step in coding up data requires a very careful analysis of each day of the Northern Hemispheric archives of historical weather maps. This analysis reflects the ability of the technician to properly interpret the isobaric forms in terms of the many wave systems which, superposed, yield the observed pattern. At present, very few persons combine the necessary knowledge of basic wave theory and weather-map analysis. In order to standardize our procedures in this phase of the work, the one person responsible for the development of this concept has had the entire responsibility of analyzing each map in the historical series. Similarly, the wave axes projected by machine techniques to form the prognosis must be converted back to an isobaric pattern for final interpretation.

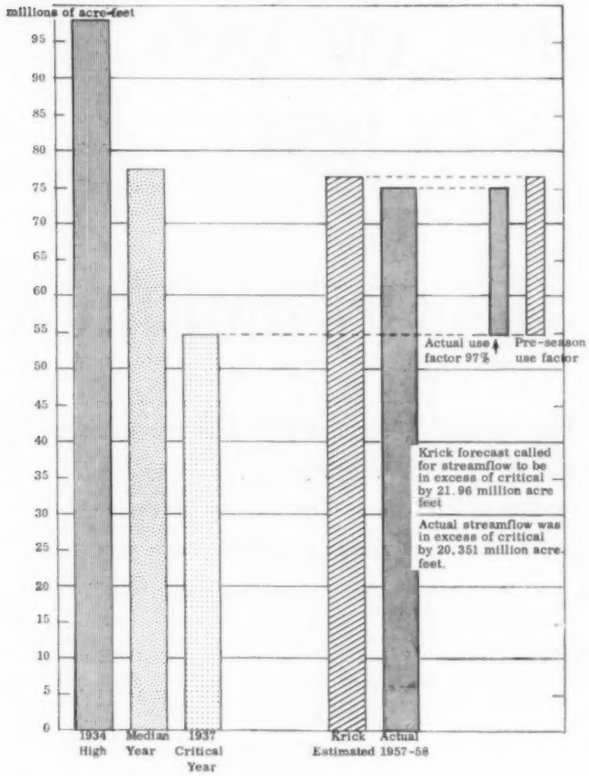


Fig. 2 Seasonal comparisons of total stream flow for the Columbia River at Grand Coulee: This chart shows the relationship between low (1937), median, high (1934), and the 1957-58 Krick stream-flow forecast as compared to that which actually occurred. Also included is the "use" factor explained in this article.

Dr. HSIA-CHIEN HUANG, a native of Shanghai, China, received his M.S. in 1935 and his Ph.D. in 1937 from California Inst. of Technology, Pasadena, Calif. He returned to China, working for his government as director of the Central Weather Bureau of China; and professor in charge of the Department of Meteorology of the National Central University in China. He escaped from the Chinese Reds to Hongkong in 1950, and worked for the Hongkong Royal Observatory as scientific officer from 1951-54. With his entire family, he entered the USA, and has worked for Irving P. Krick Associates since 1955. He has specialized in meteorology, especially synoptic meteorology.

Main publications of Dr. Huang include Frontogenetic Regions in the Far East, *published by US Government Printing Office;* Air Masses of North China, *published by US Navy;* Typhoon Structure Seen from Upper Air Data, *published by UN; several textbooks in Chinese and several minor papers written in English or Chinese.*

establishment and confirmation of dynamical principles of atmospheric behavior. In the past five years, progress has been manifold what it was in the initial phases of the work through the introduction and effective application of high-speed electronic computers in connection with these investigations. The petroleum industry, in recognition of the values of long-range weather forecasting, has encouraged this development and has within its own industry developed useful operational weather relationships. In the field of heating-oil production and marketing, these studies permit a direct utilization of degree-day forecasts and an assessment of economic values to be achieved.

It is likely, with continued research, that additional studies relating weather to other aspects of the industry, such as exploration, production, drilling, etc., will evolve. It is evident that modest expenditures for basic research in these fields will yield high economic value. Therefore, investigations should be expanded and progressed—not only on an industrywide basis, but within individual companies—to rapidly attain maximum efficiency in the application of this increasingly important factor to the many operations within the petroleum industry which are affected by weather.

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END

REVIEW OF WORLD OIL LAW AND CONCESSION CHANGES IN 1958

PART I—LATIN AMERICA

In 1958 the world's oil industry was fundamentally changed by new oil laws and new concessions. This article reviews those changes by major geographical area—beginning now with Latin America, scene of dramatic reversals in policy during 1958.

ARGENTINA was the scene of Latin America's most important change in oil policy during 1958, but there were important developments in other countries as well. Exploration is underway by private companies in Bolivia, Guatemala, and Paraguay following passage of favorable oil laws. Major changes are brewing or occurred recently in Costa Rica, Nicaragua, Honduras, Cuba, Trinidad, Barbados, Puerto Rico, Haiti, Panama, Chile, and Brazil. These are reviewed in alphabetical order in the following discussion (see following pages).

ARGENTINA

In the major Latin American oil policy change during 1958, Argentina relaxed her near-monopoly over petroleum exploration and production through YPF (Yacimientos Petroliferos Fiscales), the government's autarchic oil entity. Since about three-fourths of Latin America's geographic area (including Brazil, Uruguay, Argentina, Chile, and Mexico) is under similar monopoly, Argentina's example is being closely watched.

Since the 1920's the four existing private producing companies in Argentina have not been permitted to acquire additional acreage. All exploration has been conducted by the government through YPF. The first break in this situation occurred during the Peron administration when a contract with Standard Oil Co. of California was signed, but his downfall brought that to a sudden end. Basic needs of the country, however, continued their pressure, especially the crushing cost of oil imports which during 1957 cost the equivalent of about US $367 million, nearly 42% of total exchange earnings in Argentina as a whole. Argentina is faced with an estimated 400% increase in oil demand during the next 20 years. $1.3 billion is needed to meet it, an amount no domestic source—government or private—can supply.

The new contracts signed were widely heralded as totaling about $1 billion in new investment. This would be true if they were all followed to their ultimate conclusion, but in fact all have backaway clauses under which they may be terminated before total expenditure. The principal contracts signed are those of Carl M. Loeb, Rhoades & Co., and Pan American International Oil Co. (The Union Oil Co. contract was not available in text at time of this writing.) Carl M. Loeb, Rhoades & Co., is a financial concern which manages funds amounting to about $200 million for its clients and placed securities in 1957 in amounts totaling slightly over $100 million. It devotes itself preferentially to financing private oil companies connected with production, transportation, and refining of petroleum and gas, and has a long record of activities in this field. Pan American International Oil Co. is the international operations affiliate for Standard Oil Co. (Indiana), about the fifth largest oil company in the United States.

The new contracts are the reverse of the usual type of concession in that, instead of being a debtor owing taxes and also owner of the oil produced, the companies are creditors to whom payments must be made. No taxes are payable, and the contracts do not grant any rights of property in the petroleum produced. In this lack of ownership of oil may lie their most serious defect, for whereas a company operating under a concession is owner of the oil produced and can pick its customers, Pan American and "The Bank" (as Carl M. Loeb, Rhoades & Co. is referred to) have only YPF as their customer. If YPF is unable to meet its obligations, the companies have lost their only customer; however, the Central Bank guarantees YPF the necessary dollars for Pan American and the Central Bank and Industrial Bank both guarantee payments to The Bank.

Financially, these contracts may prove to be about the same as the 50-50 profits division of a regular concession contract, especially for Pan American, which has a choice concession area, shallow drilling, and is close to the sea.

As the summaries show, there are no taxes payable by Pan American or The Bank. YPF assumes all liability for taxes, and YPF itself is exempt from income tax. Is this exemption broad enough to exempt YPF from income tax which would be levied on the companies? That is a question which remains unanswered, but it is certain that YPF hopes it does, for it is to YPF's benefit to minimize tax payments.

The question of income-tax payments by YPF and the control of operations bring up another question, which is that of USA tax liability. Presumably the companies have obtained a ruling from the US government on this point; for, if they should become subject to taxation in both countries, it would be ruinous. Actually, in view of both companies' long experience, it may be assumed they have cleared the point and are receiving exemption.

Source material for this article is taken from *World Petroleum Legislation Report*, a monthly news letter on oil law changes and concession developments published by Mona Palmer Publishing Corp., 604 Fifth Avenue, New York 20, N.Y.

PAN AMERICAN-YPF CONTRACT SUMMARY

Contract signed, July 11, 1958, between Yacimientos Petroliferos Fiscales, referred to in this summary as YPF, and Pan American International Oil Co., referred to here as the company. *Object:* YPF turns desig-

nated area over to the company, and company assumes responsibility for operations, including transportation, for which company will receive the amounts stated (Art. 1). *Scope:* Includes drilling, operation, production, recovery, and collection of oil; construction of a pipeline to C. Rivadavia and related works; and exploration and drilling necessary to determine structures (Art. 2). *Area:* Covers Anticlinal Grande (Sarmiento), also Cerro Dragon and Cañadon Grande structures and related areas, as defined on map and to be exactly defined within 60 days. Area may be extended at company's option if productive structures extend beyond boundaries specified, but may not be extended on eastern boundary of Cerro Dragon and Cañadon Grande structures. Within 60 days, YPF will furnish all technical information required (Art. 3). *Duration:* Within one year, extendible for three months, company must drill at least 40 wells using five rigs on Cerro Dragon and Cañadon Grande structures and minimum 10 wells on Anticlinal Grande and related areas. If production judged by the company to be sufficiently profitable is found, a pipeline will be begun within 60 days from end of this period and finished within 12 months. Thereafter, using minimum 10 rigs, company will drill a total of 150 wells, distributed in same proportion between structures. These will be completed within one year from date they are begun (Art. 4). *Surrender:* Company may terminate contract at end of the first year or its following three-month extension without obligation to construct the pipeline or drill additional wells specified, and withdraw all its movable equipment; any taxes thereon to be paid by YPF (Art. 5). This termination may be done separately for the Cerro Dragon and Cañadon Grande structures or for the Anticlinal Grande structure, in which case only five rigs and 50 wells are required. Once the pipeline has begun, company must complete all additional wells (Art. 5). *Procedure:* Company must produce as rapidly as "reasonable and efficient"; use accepted methods; and inform YPF three months ahead on production program (Art. 6). YPF may not restrict production or reduce it below MER (Art. 6). *Delivery:* Company will deliver to YPF all petroleum produced except that used or lost in operations (Art. 9). YPF will pay for same at price specified. If PYF cannot accept it all, it will pay for full amount tendered (Art. 8). When YPF is able to accept less than 20% of amount tendered, it can regularize its obligation by accepting all oil tendered by company within succeeding 90 days (Art. 8). *Payment:* YPF will pay company $10 in USA currency per cubic meter (US $1.59 per bbl) for all oil produced and delivered (Art. 9) as complete payment for the company's services. Payment will be 60% in US dollars; 40% shall be payable in pesos or dollars at YPF's option (Art. 9). YPF pays all taxes and/or duties or charges of any kind to which company is liable (Art. 10). The $10 per cubic meter payment will be fixed for five years and thereafter fluctuate with the international price for crude petroleum (Art. 11). Payments in pesos will be at free exchange rate (Art. 12). Dollars for payments by YPF will be guaranteed by the Central Bank of Argentine (Art. 13). *YPF wells:* Any producing wells drilled by YPF on contract structures previous to contract date will be operated by company for YPF on nonprofit basis (Art. 14). *Imports:* Beginning with third year of contract, company has preferential right to supply one-third of YPF's crude imports, based on 1957 levels (Art. 16). Company must meet bids from other parties on same (Art. 16). Company will also be allowed to import equipment and materials necessary, with any duties payable thereon to be paid by YPF (Art. 15). *Gas:* If gas is found, the company will study with YPF possibility of development in a manner similar to this contract (Art. 17). *Duration:* 15 years from effective date, with option to company of five-year extension (Art. 18). On expiration, all equipment and installations become property of YPF without charge (Art. 18). *Transfer:* Company may transfer or assign contract with YPF's consent, thereby relieving company of obligations thereunder if transferee accepts same (Art. 19). *Indemnity:* In event of acts by YPF or any public authority which prevent company from carrying out normal activities, YPF will pay company within 180 days a sum equal to value of total recoverable proved reserves within contract area on same price basis as crude-production payments, minus average annual producing expenses (Art. 20). *Arbitration:* Every dispute arising on interpretation of contract will be referred to arbitrators who are not bound to follow rules of judicial procedure (Art. 21). Contract signed July 11, 1958.

C. F. LOEB, RHOADES & CO.-YPF CONTRACT SUMMARY

Contract signed, July 20, 1958, between Yacimientos Petroliferos Fiscales, hereinafter referred to as YPF, and Carl M. Loeb, Rhoades & Co., hereinafter referred to here as the Bank. *Objective:* To increase production, transport, and refining of petroleum; Bank to afford all financial requirements necessary for operations; Bank to be repaid from value of increased production starting 12 months after production (Preface and Art. 1). *Area:* Within 120 days, YPF to select structures from those presently in production which will offer maximum possibilities, Bank to choose or refuse same. YPF will furnish all pertinent information regarding the structures. Boundaries thereof to be adjusted to include all productive limits (Art. 2). *Development program:* Within 90 days, a program for development of the contract area will be drawn up, including all expenditures necessary (Art. 3). *Financing:* Bank will meet all expenses necessary, estimated at $100 million (Art. 4). *Operations committee:* Within 30 days, parties will set up Operations Committee of four members, two from each party—each member having one vote—one to act as chairman and to have casting vote in case of a tie. All decisions are to be by majority vote. Authority of the committee is sole and exclusive over the contract area, including studies and selection of contractors (subject to YPF's approval), acquiring materials (with preference to domestic suppliers if price is not more than 5% over import prices), and all decisions on wells; and administer wells and installations (Art. 5). Both parties will be bound by modern norms of efficiency (Art. 6). The committee will make use of YPF technical and operational personnel (Art. 7). *Title:* Bank may not acquire title deeds to land or petroleum in contract area, such title to remain with YPF, but Operations Committee will have exclusive control (Art. 8). YPF may designate representatives who will have access to the books at any time (Art. 9). Bank will make regular reports on expenses and work performed (Art. 9). *Delivery of oil:* YPF will take immediate delivery of all oil offered, and will construct transportation facilities from delivery points onward (Art. 10). YPF will make every effort to find markets for natural gas produced (Art. 10). *Payments:* Payments to the Bank will be limited to stated percentages of the value of foreign exchange saved as a result of production under contract (Art. 11). For computing such value, it will be assumed the production replaced an equal amount of imported hydrocarbons valued in US dollars and using the "imported and delivered market price" for oil of the same quality, including purchase price and all additional expenditure needed including transport, etc. (Art. 11). For natural gas, the selling price will be that actually received by YPF, but in no case less than imported and delivered market price of heavy fuel oil of same calorific content (Art. 11). Any disagreements on price will be settled by arbitration (Art. 11). All disbursements by the Bank will be submitted monthly and repaid by YPF (Art. 12). On 20th of every month YPF will pay Bank an amount equal to 50% of the value of exchange saved as a result of Bank production after subtracting production estimated as coming from productive wells existing on contract date (Art. 13). Reimbursements for expenditures, however, will be made from 100% of exchange savings (Art. 13). No payments will be made during first 12 months following date payments should start, and half of payments due shall be deferred for the subsequent 12 months (Art. 13). In addition, YPF will pay on 20th of every month a sum of money equivalent to 20% of exchange savings; however, this 20% can be reduced to a minimum of 15% by reduction of 0.25% for every 5,000 bbl daily produced over 25,000 daily average over one month's time, and said 20% shall be subject to a further reduction of 0.25% for each 25 US cents of excess over US $2.50 per barrel of the monthly average of the "imported and delivered market price" (Art. 14). Payments shall be made as long as production continues from the contract area (Art. 15). (This clause was amended later to provide for payments for 20 years from "full development of the structure.") Option is given to YPF to make one sole payment for recoverable reserves and thus cancel the Bank's right to the 20% payment but not to the payment of 50% under Art. 13 of the contract (Art. 15). All payments made in US currency except expenditures, which will be paid in Argentine pesos (Art. 16). Bank shall be free of all currency or exchange control, but YPF will not guarantee any peso exchange rate (Art. 16). Parties will draw up program covering installations outside contract area, including pipelines which are necessary for transportation of production to refining and marketing centers (Art. 17). These shall be constructed by the Bank and delivered for operation by YPF with repayment by 20-year unconditional obligation bonds issued by YPF (Art. 17). YPF will provide all installations necessary which are not included in this installation program (Art. 18). If YPF does not accept all of petroleum tendered, payments will nevertheless be calculated on amount tendered (Art. 19). If Bank is prevented for 30 days from fulfilling obligations by some reason outside its control, but not outside YPF's or other government agency's control, YPF must repay immediately total Bank expenditures plus interest and all payments stipulated in Art. 14 up to exhaustion of production (Art. 20). The Central Bank guarantees exchange availability for YPF's obligations, and Industrial Bank guarantees compliance with all YPF payments (Art. 21). *Taxes:* YPF will pay all taxes levied by any national, provincial, or municipal government on activities related to the contract (Art. 22). *Additional area:* Contract may be extended to cover additional contract areas, which will be then subject to new development programs and to the terms of this contract (Art. 23). *Equipment imports:* YPF will facilitate all imports of equipment, supplies, and per-

sonnel (Art. 24). *Arbitration:* All differences will be settled by arbitration, under procedure specified in contract (Art. 25). *Force majeure:* Validity of contract will not be affected by suspension due to *force majeure* (Art. 26). Acts by Argentine government may not be invoked as *force majeure* by YPF (Art. 26). *Cancellation:* In event of violation, admitted or decided by arbitration, either party may demand correction or request annulment of the contract, in which case YPF shall continue to pay Bank specified in contract for wells existing on annulment date (Art. 27). *Guarantee:* Bank must deposit guarantee in a New York bank equal to 5% of estimated cost of the program (Art. 28). *Scope:* Covers all hydrocarbons produced or extracted (Art. 29). Contract must be approved within 10 working days by the National Executive (Art. 30). It will continue in force until all payments and obligations are completed (Art. 31). For legal purposes, parties must submit to Argentine Republic's courts (Art. 31).

LANE WELLS-YPF PROPOSED SERVICE AGREEMENT

Proposed agreement is for completion of wells and workover jobs under conditions stipulated in Lane Wells offer of July 1, 1958 and complimentary letter of July 2, 1958 which form part of agreement (Art. 1). *Investment:* $2.5 million initially in equipment for completion of wells up to depth of 4,000 meters with 2⅞-in. tubing and ancillary equipment, with option by Lane Wells to increase investment up to $10 million or more (Art. 2). *Supervision:* Operations to be carried out in wells indicated by YPF and under YPF supervision (Art. 3). Wells to be handed over by Lane Wells ready for production or, if dry, abandoned in accordance with YPF instructions (Art. 4). *Payment:* 50% of payment in Argentine pesos, YPF to "collaborate" in obtaining authorization to remit amounts abroad in dollars corresponding to amortization, interest on investment, salaries and expenses of foreign personnel (Art. 5). *Scope:* YPF guarantees a minimum of three years' work at rate of 20 days per month for equipment, working 24 hours daily (Art. 6). *Contract:* YPF and Lane Wells to start immediately drawing up definitive contract within six months; Lane Wells to send necessary specialists within shortest possible time, and to begin operations as soon as possible after contract signed (Art. 7). This agreement is to be cancelled on signature of the definitive contract or expiration of six months if contract not signed (Art. 8).

USSR-YPF AGREEMENT

Supplier: V/O, Sojuznefteerpor, Moscow, USSR, represented locally by the Soviet Commercial Representation. *Product:* Crude oil which must respond strictly to the physiochemical specifications supplied by the Soviet Commercial Representation and on which the USSR must still clear some concepts. *Quantity:* One million metric tons (7,500,000 bbl, approx.) with a tolerance, plus or minus, of 10% at YPF's option. *Delivery:* Deliveries commence July 1, 1958, and must be completed July 31, 1959, in monthly quotas of 75,000 to 80,000 metric tons, in loadings from 11,000 metric tons to 18,000 metric tons each, approximately five to six monthly shipments. *Sales conditions:* CF (cost and freight) Argentine ports (La Plata or Buenos Aires) or, at buyer's option, fob conditions, if shipping is available. *Price:* CF price at US $2.33 per barrel for 31 to 31.9 API gravity oil. Basic price will fluctuate in accordance with the variations in the international market of the fob price of Kuwait crude, on day of each loading. The price of this latter crude on June 1, 1958 was US $1.85 per barrel. Also, if gravity is higher or lower than that indicated above, the CF price will be increased or reduced at the rate of US $0.02 per barrel (*sic*). The freight component of the CF quotation is a fixed amount of US $6.00 per long ton. In the case of the shipment being unloaded at two different ports at the buyers' request, the freight shall be charged according to the corresponding "scale" tariff. *Payment:* The CF or fob cost, as may correspond, shall be paid in dollars of the Argentine-Soviet agreement.

USA GROUP-YPF PROPOSED CONTRACT

Companies involved in the USA group offering the following proposed contract include: Atlas Corp., The Hidden Splendor Mining Co., Petro Atlas Inc., William Bros. Corp., Mid-Continent Exploration Co., and Ferrostal AG. Terms are: *Investment:* Group will supply material, equipment, etc., up to the amount of US $50 million within a three-year period, at normal current market prices. Payment will be made 20% cash in Argentine pesos and 30% in dollars payable starting three years after delivery, over a subsequent three-year period at a 4.75% annual rate of interest. *Area:* Seven million lineal meters (about 4,000 wells) in Comodoro Rivadavia, over a six-year period. Payment will be made against delivery of each well finished and ready for production, in Argentine pesos and in dollars. The prices involved in this service contract will be fixed in the contract, likewise the proportions to be covered in pesos and in dollars. *Pipeline:* Group will study, together with YPF, the construction of a large-diameter gas pipeline from Comodoro Rivadavia to Buenos Aires, with a tie-in from Plaza Huincul. In this respect, the firm of Williams Bros., which forms part of the American group, will send a group of technicians to Argentina. *Factory:* Group will set up a factory, for the manufacture of equipment needed for the oil industry, at a total cost of at least US $5 million. *Payment:* Group will sell to Argentina 2.8 million cubic meters (17.6 million bbl) of crude oil and petroleum products over a two-year period at normal market prices, against immediate payment of 20% and the balance in four half-yearly quotas, after receipt of the product, plus interest at 4.75% annually. The group may increase the total volume of sales to 5.6 million cubic meters of crude oil and petroleum products over a three-year period. *Loan:* Group will grant a loan of US $30 million to the Central Bank of the Argentine Republic for a five-year period, at bank interest, applicable to the financing of the works. *Production:* Estimated production target: crude oil (in cubic meters): 1959—550,000; 1960—1,800,000; 1961—3,600,000; 1962—5,500,000; 1963—7,000,000; and 1964—8,500,000. Gas to be moved (expressed as equivalent cubic meters of oil): 1961—800,000; 1962—2,500,000; 1963—3,800,000; and 1964—4,000,000. The valuation of this production is in the region of $650 million in six years, with a foreseen investment for the works covered in this agreement of approximately 450 million dollars over the same period. It is estimated that, with the credits stipulated in the said agreement, it will be possible to finance the operation, should it be accepted, by means of contracts favorable to the parties concerned.

SEA DRILLING-YPF LETTER OF INTENT

Sea Drilling Corp. (USA) agreement as follows: *Total investment:* Not specified. *Area:* Development of the continental submarine shelf in the vicinity of Comodoro Rivadavia. *Financing:* As sole compensation, the company shall be entitled to a fee of $10 per cubic meter of petroleum delivered to YPF in Comodoro Rivadavia. Payment will be made 60% in dollars and 40% in nonconvertible Argentine pesos. Upon expiry of the contract, all equipment and installations, with the exception of ships, will become the property of YPF. Exploration will be carried out over a period of six months for the account of the company.

MECOM, SWISS-GERMAN OFFER TO YPF

Offer was made, July 23, 1958, by president of Conferro SA on behalf of DURUM AG of Zurich, Switzerland, a Swiss-German group headed by John W. Mecom. Terms of offer are: *Area:* Submarine areas in vicinity of Comodoro Rivadavia. *Scope:* Exploration, drilling, and transportation of production found. *Payment:* US $6.00 plus the equivalent at US $5.00 in Argentine pesos computed at free-market rate per cubic meter extracted and delivered to YPF. *Expenses:* All exploration, drilling, and other expenses to be absorbed by the Swiss-German group and associated firm of John W. Mecom, Houston, Texas.

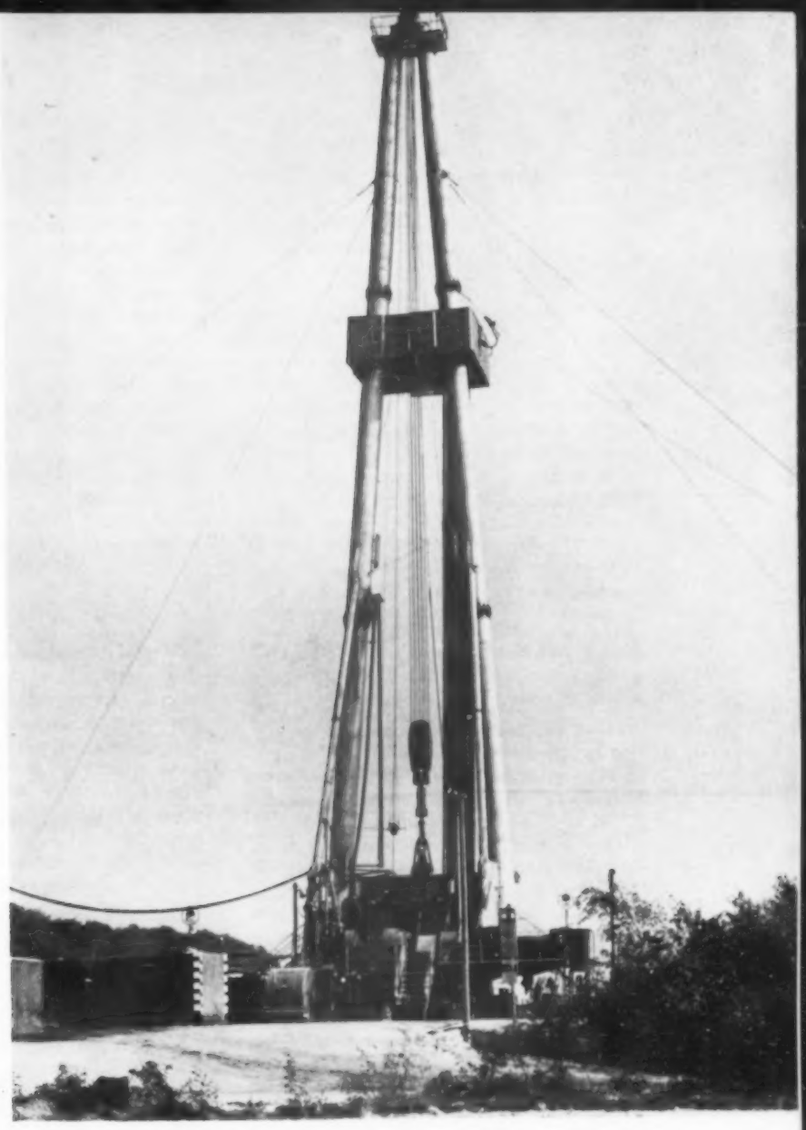
PETROFINA-YPF LETTER OF INTENT

Petrofina SA, a Belgian company, addressed letter to YPF offering contract along following lines: *Estimated investment:* US $35 million. *Type:* Service contract. *Area:* Drilling is to be carried out in areas indicated by YPF. *Payment:* To be made as wells are brought in and petroleum is delivered to YPF. Payment for material and consumer goods, at prices to be agreed upon, become property of YPF as they are amortized. Direct expenses paid by unit of work, meter drilled, or meter of piping. One dollar per cubic meter for the amortization of equipment and financial charges. One dollar per cubic meter for indirect expense and profits over 10 years on the basis of production effectively delivered to YPF. *Number of wells:* 200. *Duration:* 10 years. *Estimated production:* 1,000 tons per day (7,500 b/d) when the proposed program fully developed. *Compensation:* Direct expense: real cost, depreciation, indirect expense, and profits assessed per cubic meter of petroleum delivered. *Payment:* In dollars, pounds sterling, or Belgian francs for imports; and in Argentine pesos for work performed and investments made in the country.

CONORADA-YPF LETTER AGREEMENT

Letter of July 23, 1958, by Conorada Petroleum Corp. to Dr. Sábato of YPF. Conorada expresses interest in carrying out drilling and production of all forms of hydrocarbons, including "preliminary, complementary, and ancillary work" for transport of petroleum until delivery to YPF. Proposal is as follows: *Area:* Conorada will drill and produce in areas agreed upon, with YPF to furnish all information in its possession regarding such areas. *Production:* To be turned over to YPF with payment to Conorada partly in dollars and partly in pesos in a manner to be agreed upon, such as a given amount per cubic meter produced or a fixed percentage of net profits. *Duration:* 20 years. *Investment:* Maximum $100 million. *Imports:* Materials imported to be free of import or any other duty.

(Continued on page 110)



Drilling rig of Salzgitter design (Gulliver mast) on the wildcat well Schledehausen 2.

Germany nears 100,000 b/d

by Dr. A. M. Stahmer

CRUDE production in western Germany, which at year-end 1957 was 79,000 b/d, had reached 87,192 b/d in June 1958, and probably will reach 100,000 b/d by 1959 or 1960.

Until recently it was believed that, after 20 years of intensive exploration, new prolific discoveries could be looked for only in deeper geological strata, specifically the pre-Salinarian in northwestern Germany. Drilling during the first half of 1958, however, has indicated promising discoveries may still be looked for in the shallower formations which up to now have supplied the bulk of the crude. This was supported by success in wildcats of Bramhar-Wettrup in the Weser-Ems district, Knesebeck in the oil province of Hanover, Offenbach in the Upper Rhine Valley, and Muehldor-Sued, as well as Moenchsrot in the Alpine Foreland. For the first time good oil shows also were encountered in Murnau No. 1 well in the folded Molasse of southern Bavaria. New geological and seismic-reflection applications sparked exploration in several oild fields, resulting in doubled or trebled previous output.

Geophysical and drilling activities have been maintained at a high level. In the first half of 1958 producing companies drilled a total of 1,213,143 ft of deep holes, a decline of only 16,000 ft from the same period in 1957—due entirely to drilling of producing wells in proven fields. In the same 1958 period, wildcat and extension-well drilling was higher than in 1957. Exploratory wells rose to 45.9% from average 44.9% in 1957.

At the beginning of 1958, proved and probable reserves were at about 69 million metric tons, according to the German Geological Survey (Amt fuer Bodenforscung) and oil-company geologists, 2.4 million tons

Geophysical crew of Mobil Oil AG operating in the offshore area of the North Sea coast.

higher than the year previous. If the 1957 production of 3.9 million tons is subtracted, actual increase is 6.3 million tons.

Estimated German Oil Reserves As of January 1, 1958—Tons

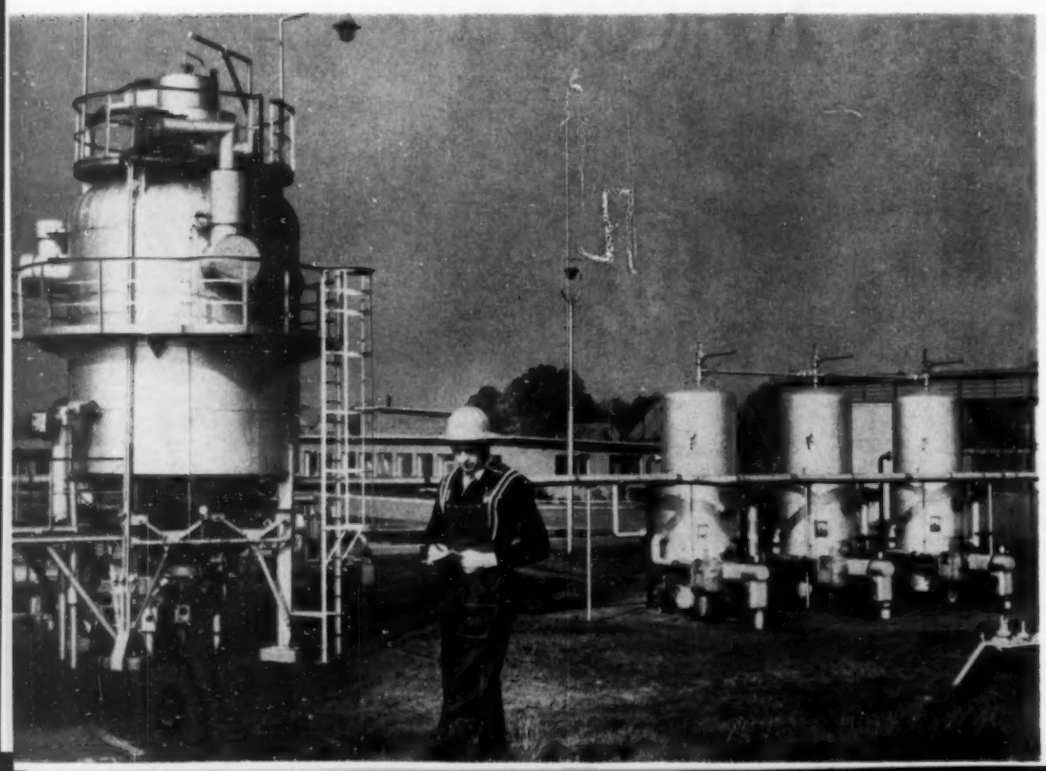
	Proven	Probable	Total
Holstein	3,382,000	1,140,000	4,522,000
Hanover	20,223,000	4,491,000	24,714,000
Weser-Ems district	11,207,000	4,270,000	15,477,000
Emsland	16,620,000	4,200,000	20,820,000
Upper Rhine Valley	1,683,000	1,005,000	2,688,000
Alpine Foreland	280,000	285,000	565,000
Total	53,395,000	15,391,000	68,786,000

Reserves were stepped up significantly in the oil region between the Weser and Ems Rivers, the increase amounting to about 3.4 mililon tons after deduction of current production. Proven reserves accounted for the major increase, which in 1957 amounted to some 1.7 million tons. Probable reserves rose by 0.7 million tons. According to the Association of German Crude Producers (Wirtschaftsverband Erdoelgewinnung), oil production should reach 4.2 million tons in 1958, 4.4 million in 1959, and 4.5 million in 1960. This appears conservative, as acutal output in the first half of 1958 was 2,122,366 metric tons. As production is increasing daily, it is likely that 1958 output will reach 4.4 million tons.

An estimate of the Geological Survey indicates the main suppliers of indigenous crude are the horizons of the Cretaceous, mainly the Wealden and the Valendis. At least 46.5% of Germany's total output came from the Cretaceous in 1957. The Jurassic, primarily the Dogger, ranks second with 46%; Tertiary 3.9%; Triassic (Keuper) 2.9% and Permian (Zechstein 0.7%. Compared with the previous year, the Jurassic and Tertiary have increased, with slight decline in the Cretaceous and Keuper. With respect to the individual West German oil provinces, the Lower Cretaceous is the major oil supplier in the Emsland and between the Weser and Ems Rivers, whereas the Dogger (Jurassic) ranks first in Hanover and Holstein. In southern Germany oil recovery is exclusively from the Tertiary.

West Germany's natural-gas production declined slightly during the first half of 1958. This is not due to decreased potential, but because customers under contract took less gas. Dry-gas production amounted to about 176 million cubic meters in the first half of 1958. 12 million less than in the comparable 1957 period. Decline was in the Emsland and Weser-Ems district only. Gas production was maintained at about the previous level in the Upper Rhine; while in Bavaria output was stepped up somewhat in the Isen and Ampfind fields.

New oil finds in the first eight months of 1958 were primarily in the Weser-Ems district—with one new discovery at the end of July in Hanover oil province. On the eastern margin of the Gifhorn syncline, exploratory well Knesebeck-Dagger 2, drilled by Preussag for the Elwerath-Preussag consortium, encountered two wel impregnated oil sandstones of the Dogger beta (Jurassic) at depths of 4,354 ft to 4,393 ft, and 4,426 ft to 4,449 ft. A flow of about 25 cubic meters daily of light oil



Treater and gas separator in the Voigtei oil field of Mobil AG and Gewerkschaft Elwerath.

through a ⅛-in. choke was made on production test. The Knesbeck structure, broken by faults into separate blocks, was located by preliminary seismic surveys. The discovery is approximately 2.5 miles east of the Vorhop-Nord oil field, not far from the Soviet-dominated zone.

Noteworthy extensions in Hanover were in the old producing districts of Haenigsen, Moelme, and Broistedt. Haenigsen had a comeback with a new prolific block encountered by Mobil Oil AG. Increased output since May has been about 15,000 bbl monthly.

At Moelme, near Brunswick, oil was encountered in a new geological block 0.5 miles northwest of the Wealden section of the field which had been abandoned because of exhaustion of its wells. Gerwerkschaft Elwerath tested the main sandstone of the Middle Rhaetic in discovery well Wachtel 153, between 3,962 ft and 3,979 ft. The well flowed about 7 cubic meters of light oil per day, with gas-oil ratio about 70:1. Later wells encountered gas, or a gas-oil mixture, in a higher structure, thus proving the oil deposit is located underneath a gas cap.

Up to now production from the Broistedt field has been mainly from the Valendis (Lower Cretaceous), but the deviated extension well Broistedt 37c of Preussag-Elwerath encountered a narrow strip of oil-bearing Wealden sandstone. However, because the structural position of the reservoir is actually very steep, the sandstone find probably is quite deep. Pumping tests from a depth between 3,224 ft and 3,283 ft yielded 27 to 29 cubic meters per day of crude with a specific gravity of 0.895. July 1958 output of Broistedt was 712 tons against 251 tons in July 1957. Moelme output was 625 tons in July 1958, against 124 tons in July 1957.

A promising find was made in June east of the Ems River, in the westermost part of the Weser-Ems district. Wildcat Wettrup 2, drilled by Itag for the consortium Elwerath-DEA-Itag-Preussag-Wintershall, encountered well defined layers of the Bentheim (Valendis) sandstone, the well-known reservoir rock of the Emsland. Situated about five miles northeast of the Lingen oil field, crude output on the pump was approximately 8 cubic meters daily from about 3,300 ft.

About 0.5 miles southwest of discovery well Wettrup 2, exploratory well Lingen-Bramaar 2 struck oil in the Bentheim sandstone, 128 ft thick. The well is on the concession of the consortium Deutsche Schachtbau, Gewerkschaft Elwerath, and Mobil Oil. On production test, the well flowed 1.5 cubic meters per hour of crude through a ⅛-in. choke. Specific gravity was 0.88.

At Wehrbleck, eastern Weser-Ems district, where tests had been successful in wildcat Wehrbleck 1 early in December 1957, a second well came in for Gewerkschaft Elwerath-Mobil Oil. The well opened a new oil-bearing horizon. Wehrbeck 1 produces from the Aldforf Serpulite lime (Upper White Jurassic); Wehrbleck 2, about 0.5 mile to the west, was succesful in a Kimmeridge sandstone between 3,456 ft and 3,469 ft. Initial flow was 13 cubic meters of crude through a ⅛-in. choke.

August saw a noteworthy extension of the Hebelermeer field in the Emsland district. A new productive block was discovered by the consortium Mobil Oil-Deutsche Schachtbau-Gewerkschaft Elwerath about 1.5 miles west of two Hebelemeer producing stripper wells. Exploratory Hebelermeer 9 encountered considerable oil-bearing Bentheim sandstone (Valendis) between 4,144 ft and 4,328 ft. The sand was opened between 3,954 ft and 3,996 ft; flow was approximately 25 cubic meters daily of light crude through a ⅛-in. choke. Gas-oil ratio was 29:1.

Natural gas was found in March in the main dolomite of the Zechstein between 8,957 ft and 9,088 ft, in wildcat Kalle 1 of C. Deilmann-Elwerath-Preussag-Wintershall, near the Dutch border. Production tests yielded a commercial flow of gas. The geological structure at Kalle differs from the neighboring oil and gas field of Emlichheim.

In the Upper Rhine Valley, Deutsche Erdoel AG disovered oil in two horizons at Offenbach, about three miles east of the town of Landau in the Palatinate. Discovery Offenbach 1 encountered oil-impregnated sands of the Cyrena marl (Tertiary) between 3,523 ft and 3,536 ft. Initial output on the pump was four to five tons daily of paraffin crude; specific gravity was 0.843. A second prolific horizon was encountered by DEA well Offenbach 3, about 1,000 ft east of 0.1 on the other side of a north-south striking fault in the variegated range of the Niederroedern beds. Flow tests averaged 14 tons daily of crude through a 1/12-in. choke from a depth of 3,346 ft to 3,412 ft. Further wells will indicate the size of the new deposit.

A new search for oil in the Alpine Foreland was sparked by some promising drilling results during the first half of 1958. Oil was discovered in March in wildcat Moenchsrot 2 belonging to the consortium Wintershall-Gewerkschaft Elwerath, about eight miles west of Memmingen town, not far from the small oil field of Heimertingen. This well produced the first commercial oil in the province of Wuertemberg. Moenchsrot 2 struck oil-impregnated sands of the Freestone beds (Oligocene) between 4,852 ft and 4,841 ft and also between 4,834 ft and 4,811 ft. The well later became a pumper. In July 1958 Moenchsrot, which thus far is the westernmost oil field in the Molasse basin, produced 710 tons of crude.

Two new discoveries were made east of Munich, where oil and gas has been produced since 1954. At the beginning of March, wildcat Muehldorf-Sued 1 struck oil at approximately 5,900 ft in the lower section of the Ampfing beds (Lattorf). The well belongs to the consortium Elwerath-Mobil Oil-Preussag, and is located about 2½ miles southeast of the Ampfing oil field. Initial yield was approximately 20 cubic meters per day of crude through a ⅛-in. choke from between 5,907 ft and 5,922 ft. In July 1958, Muehldorf-Sued produced 336 tons of crude.

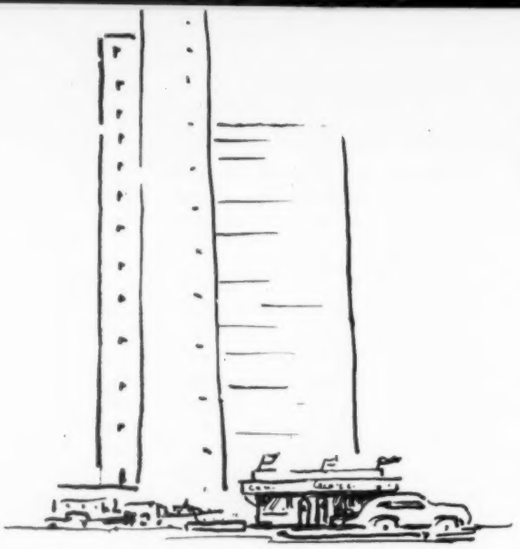
Natural gas was discovered by exploratory well Moosach 1 of Mobil Oil-BMI-Preussag-Elwerath, approximately 12 miles southeast of Munich, in the Lithothamnia limestone of the Lattorf formation (Tertiary). A flow test yielded 1,900 standard cubic meters of gas and 100 liters of condensate per hour through a ⅛-in. choke. Moosach 1 is located south of an antithetic fault, which continues in a northeasterly direction toward Albaching, on a geological high located with the help of seismic reflection surveys. The Lithothamnia limestone was encountered close to this fault and underneath it. The gas was between 9,438 ft and 9,571 ft.

Exploratory well Murnau 1 of Preussag attracted considerable attention when it found promising oil and gas traces for the first time in the folded zone of the sub-Alpine Molasse, extending in a narrow strip in front of the Alps, at a depth of approximately 9,200 ft. The specific gravity of the paraffin crude was very low. Production tests thus far have been hindered for technical reasons. Murnau is located about 15 miles north of Garmisch-Partenkirchen.

Efforts of German oil companies in foreign countries have been extended, but without much success thus far. The consortium Deutsche Erdoel AG-Gewerkschaft Elwerath-Wintershall discovered oil at Maquia in Peru, east of the Andes. Long-term production tests will show whether a sustained commercial output can be maintained.

C. Deilmann Bergbau GmbH for some years has carried out exploration in Spain, Greece, and Turkey. Deutsche Erdoel AG is drilling on its concessions in Syria, and has begun geological and geophysical surveys in the southern part of Turkey. Gewerkschaft Elwerath drilled a wildcat near Lausanne in Switzerland on a joint concession with SA des Hydrocarbures. The Ceepee Oil Co., and affiliate of Wintershall AG, is wildcatting in Saskatchewan. Deutsche Schachtbau-und-Tiefbohrgesellschaft GmbH has a drilling job on contract with Ste Nationale de Rechèrches et d'Exploitation des Pétroles en Algérie (REPAL), 250 miles south of Algiers in the Sahara. Deutsche Schachtbau also acquired an interest in Petrolifera Iberica which has concession rights in northeastern Spain. Gelsenkirchenzer Bergwerks-AG, of Essen, the largest mining concern in the Ruhr, acquired a 25% interest in the oil concessions of Socony Mobil Oil in Libya. (Gelsenkirchener operates the refinery and hydrogenation works with Mobil Oil at Gelsenberg.)

With respect to operations in foreign countries, the primary aim of the German companies is to secure their future share in the home oil market. Consumption, which is rising rapidly, may diminish if the firms continue to base their production on indigenous sources only. END



The oil business is small business

To aid dealers and distributors solve business management problems, Cities Service has developed a business library of specialized information for the small businessman

by Nathalie Ronis*

THE OIL BUSINESS is small business. Many people think it's big business. Actually, a big oil company stands because of the shoulder-to-shoulder support of small crude-oil producers and refined-product retailers.

Twelve years ago, in recognition of the special needs of its many thousands of independent businessmen-customers, the Cities Service management created the Department of Business Research and Education. It was specifically charged with the task of finding ways to help 20,000 dealers and distributors become more successful. The job was complicated by the fact that they were at various levels of management development, and each was extremely jealous of his independence.

In our business library and annual catalog, we believe we have found an approach which does not do violence to his independent nature which in the past has thwarted training efforts. By providing a "cafeteria of knowledge," the library and catalog encourage a businessman to build on his previous experience.

Today the business library consists of eight file boxes of 94 books, pamphlets, and brochures covering a wide variety of management information. These are placed strategically in the marketing divisions so that company personnel and dealers and distributors may examine this information at their leisure.

A companion to the library itself and the fundamental reason for its success is the annual catalog which is published by the department and sent to all dealers and distributors. The catalog, revised annually to meet changing management information needs, is liberally illustrated and carries brief descriptions of all the material in the library. Order blanks are included in every catalog so that the reader may order the books or pamphlets which fit his particular need.

How effective are the business library and the catalog in bringing management information to Cities Service's 20,000 small business marketing customers? Statistics reveal part of the answer. The following figures show the number of publications requested since the catalog was first published:

1951 — 7,012	1955 — 40,135
1952 — 5,594	1956 — 64,075
1953 — 15,766	1957 — 114,259
1954 — 27,560	1958 — 98,401 (first 9 mos.)

Through an improved catalog and better promotion among the company's marketing division, demand for business-library materials during 1957 broke all records, exceeding the combined requests for the two previous years. In the past five years, demand for materials soared to 20 times the initial annual circulation.

Twelve years of painstaking research went into making the business library what it is today. The story of its growth and development may help other companies who want to develop a program to improve the management ability of the small businessmen with whom they deal, both here and abroad.

The state of a dealer's or distributor's business is the sum total of himself: his past experiences, his strengths and his weaknesses. Very often his background does not contain the proper blend of knowledge and experience for him to develop his entire business potential. In addition, he faces constant change in his market. Last year's answers will not always solve this year's problems. Before any change or improvement can take place in the business, the man himself must change. He must grow for his business to grow.

Early in our research, we learned many things about the nature of the independent businessman. Not least of these was that the management problems of a small business are not unique to one industry, nor even to one segment. While his operating problems may differ, his management problems will remain the same—regardless of size, trade, or industry.

Our research revealed that the businessman needs a source of management aids which he can use if and when he chooses and which will change in the light of new knowledge as the science of business management evolves. Our studies among all groups dealing with small business, such as government, industry, banks, trade associations, and the small businessmen themselves, led us to decide on a business library. In essence, this would be a "cafeteria of learning," where each manager could choose for himself the type and level of information he needed to improve his business ability.

In setting out to collect the information our dealers and distributors needed, we concentrated on five subject areas—*market, money, men, methods,* and *merchandising* —and five skills:

1. *How to recognize* an opportunity.
2. *How to plan* to take advantage of the opportunity.
3. *How to organize* the business for action.
4. *How to measure* the results achieved.
5. *How to decide* what changes should be made.

In every case the emphasis was on *management* rather than on operations as such. We were concerned with finding material written from the viewpoint of the small marketer to help him build his business and enlarge his profits—not merely to "move more products."

Instead of material which reflected a company viewpoint, we filled the library with information from sources the dealer and distributor would recognize as impartial authorities in their particular fields; for example, a cash-register company on how to make change; magazines and newspapers on how to use advertising intelligently; banks on how to judge credit intelligently; motor companies on how to fuel and lubricate their products.

Even this approach, however, met an objection to company training and informational literature which we had heard many times from small businessmen. Wary of the "hidden hook," they feared the price tag on the "free" education offered by the company would be higher than they were willing to pay. They felt that training

*Business Research and Education, Cities Service Petroleum Inc.

meetings or classes sponsored by their suppliers would "teach only what's good for the company, not for us." They listened guardedly to company representatives. They avoided slick material. We often found expensive literature lying dusty and unused in a back room because it reeked of company advertising.

We recognized that just as the small businissmen's informational needs differed, so did their levels of understanding. One of our first jobs was to revise the materials prepared by a wide variety of companies, institutions, and associations. We eliminated the unreadable, overtechnical trade jargon which so often fills management books and pamphlets.

Our readers not only had different learning speeds, they also varied in the time they could spend learning. Some had time to study in the morning; others after midnight; still others caught minutes between jobs. In all cases, their time was limited. This meant preparing short booklets or pamphlets filled with bold type, ample white space, and simple sketches to quicky put across an idea.

After establishing the approach, we still had to develop techniques for getting the information to our readers. At first, the library was made portable, placed in war-surplus foot lockers, and brought to the customers by the company representatives. At the first sign of interest, the dealer or distributor would be shown the library. If he thought he might like to read one of the books, such as *Business Principles and Management*,[1] or a *Handbook of Business Management Aids*,[2] he was sent a copy. Very often he could not pinpoint his problems beyond the vague "I don't have enough money." To such a man we suggested books like *Financing a Small Business*,[3] or *The Small Businessman and Sources of Loans*.[4]

But this was a cumbersome approach. Even after establishing a business library in each of the company's divisions, we found the salesmen reluctant to offer the material. They found it easier to try to make an *immediate* sale than to offer a man a book which would be a source of ideas leading to *future* sales.

It was then—in 1952—that we turned to the present system of keeping the business library stationary in each division and sending to each of our dealers and distributors a catalog describing the library's contents.

In examining the library today, you'll see something emerge which is even more decisive than soaring circulation figures. Cities Service marketers are not the only businessmen using business-library services. Letters from nonindustry small businessmen pour into BR&E's offices to swell request totals. The material prepared especially by the department, or revised and edited by its staff, has also proved popular with schools, colleges, universities, and even distributors and dealers supplied by competitive oil companies.

When *Changing Times*, a monthly magazine published by Kiplinger, recommended business-library booklets in three of their issues during 1957, letters came in from diverse sources. Request for *Tips on Making Change*,[5] for example, came from organizations like Disneyland, the U. S. Military Academy, training directors of large corporations, and from owners of hardware stores, dress shops, laundromats, and restaurants.

All types of business and government officials asked for copies of *Self-Analysis of the Supervisor*.[6] Training directors of large corporations also showed great interest. Many others who wrote in were officials from the Department of Defense, Massachusetts Institute of Technology, National Broadcasting Co., General Electric, Westinghouse, and small businessmen from a wide variety of trades and industries.

Word of the catalog has also spread abroad. Within recent weeks a Norwegian businessman requested some of the business-library booklets, expressing his gratitude to Cities Service "for placing so much hard-won knowledge at the disposal of everyone." An Australian wrote for material, describing himself as "a young man endeavoring to acquire as much knowledge as possible concerning the operation of service stations and motor maintenance with a view to opening my own station as soon as I have the necessary capital and experience."

The increasing demands for library materials attest to their value to those who use them. They also reflect the continuous research which backs up every selection. As the relatively new science of management matures, more and more information is published. All of it must be reveiwed and weighed for its usefulness to the small businessmen. Each man is in a different stage of development. The business library, then, must include varying levels of treatment of important subjects. For example, *Small Business Management*[7] is a unit workbook, written at a high-school level. *Management of a Small Business*,[8] covering the same topic, is a university-extension-division correspondence-type course at a college level. *Business Management Handbook*,[9] also in the same general area, is an advanced management text treating the problems of a company as a whole.

BR&E sometimes originates material or encourages its development by others, if our wide range of sources cannot supply such information ready-made. A new item in the 1958 library, *How to Attract Female Customers*[10] (in service stations), is an example of how the department stimulates an outside group to develop a new approach to a common industry problem. In this case, a company which supplies uniforms prepared a booklet on station housekeeping, on the basis of its own research and following our verification in the field.

But in most cases we are able to adapt good material prepared by other groups which has not been too popular in its original format. This accounts for the relatively low cost of maintaining and expanding business-library services.

The work of the department of business research and education among small businessmen is not limited to the business library. We use additional channels to convey management information. Articles in the trade press and talks before business groups in and out of the industry funnel some of the results of constant field research among oil marketers, manufacturers, bank officials, educators, management consultants and trade associations.

The department also publishes a monthly management information bulletin covering a wide variety of subjects of interest to wholesalers of gasoline, fuel oil, and liquefied petroleum gas.

We maintain a stock of informative books, pamphlets, and articles which supplement the business library. Last year, including business-library materials, over 200,000 of these were shipped from the department's supply library. The resources of the department include a reference library of over 2,000 volumes—one of the largest busines libraries devoted solely to small business management.

At a time of rising costs, lowering profits, and generally falling economic barometers, the activities of the department of business research and education add up to sound economics for Cities Service. In the process of seeking solutions of our customers' management problems, we have helped this important class of customers achieve a higher level of performance, and have also contributed to improving company-distributor relations. Our dealers' and distributors' abilities and attitudes determine the satisfaction which consumers obtain from our products. Their purchases and payments, in turn, affect our profits.

Business research and education's efforts to help them help themselves is a modern application of the Cities Service policy of "always assisting our customers to obtain better results." It is also part of our philosophy of the way big business can best work with small business.

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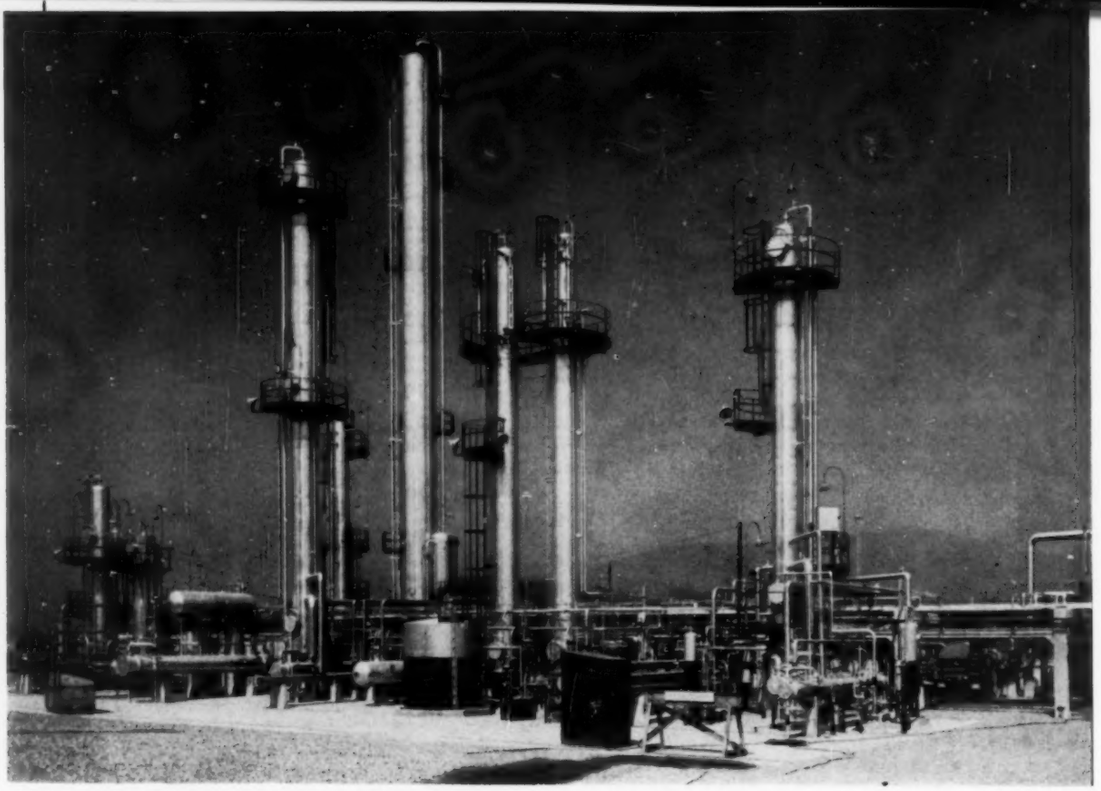


Alkylation unit at Port Moody refinery is British-American Oil's and British Columbia's first. (Note: All photos in this article by courtesy of British-American Oil Co.)

British-American completes new British Columbia refinery

Features unique in North American refining practice have been included in B-A's new $25,500,000 West Coast plant. All electronic instrumentation, remote gauging, new fire-protection equipment, and antipollution precautions are installed.

BRITISH-American Oil Co. recently completed a new refinery at Port Moody, B.C., which has been especially planned to fit into the economy of the growing West. It contains innovations unique in North America, and has a capacity of 20,000 b/sd. This capacity is double the entire Canadian crude-oil production of 12 years ago; yet the company has provided for a possible future doubling of the existing units.

The refinery is situated in a majestic scene of blue water, tree-clad hills, and snowy mountains. Murals in its buildings, following B-A's policy of encouraging Canadian folk art, show designs typical of this area of British Columbia.

Meticulous care has gone into the choice of equipment and facilities so that the new refinery truly moves B-A forward into the era of electronic controls, better petroleum products, and increasingly efficient operation. The $25,500,000 refinery, biggest single project ever undertaken by B-A, emphasizes the company's determination to grow in the West with British Columbia.

The alkylation unit is the first of its kind in B.C., and the first ever installed by B-A anywhere. The middle-distillate desulfurization unit, similarly, is the first for both B.C. and B-A. The CO-type boiler is the first in British Columbia, and Port Moody is the first refinery in Canada to install completely automatic gauging throughout. The all-electronic instrument system on the process units is the first complete installation in Canada, while the fire-protection system has a number of "firsts."

The foam-making pumper is the largest on the continent; the hose is of a new light-weight type; and the helmets worn by the firemen are, so far, unique.

The refinery, recently opened, is situ-

The 250-ft flare stack at Port Moody will burn off waste gases without smoke.

Modern fire engine at Port Moody refinery undergoes a test run.

ated at one of the most historic places on the West Coast, for it was at Port Moody, in 1886, that the first transcontinental CPR train completed its run. Port Moody is still officially listed as the end of steel, with the line which goes to Vancouver rated as a "spur."

When it purchased Union Oil Co. in 1945, B-A acquired land on Lulu Island, near Vancouver, and it was intended to build a refinery there. Later investigation caused this property to be abandoned and sold. Purchases of land at Port Moody began in 1946, and some of the early investigators lived a pioneer existence—they were actually chased by bears on the virgin timberland!

It had been intended to build closer to the water and to use salt water for cooling, but this proved impracticable when surveys showed a geological fault in the land. As a result, the refinery is built higher up on a hillside, its various buildings terraced at different levels. Water is drawn from the city of Port Moody mains.

The processing plant includes combination crude-topping and vacuum; catalytic cracking; naptha-desulfurization and catalytic reforming; middle-distillate desulfurization; and alkylation units. A contract for these units was placed with Canadian Kellogg Co. Ltd. This company placed more than $3 million worth of orders for equipment and supplies in the Vancouver area. Wages paid during building topped $5 million.

The crude-topping and vacuum unit has been designed to process 20,000 b/sd of western Canadian crudes. Products from the combined unit include gas, a 380 EP gasoline, kerosene or stove oil, diesel oil, atmospheric and vacuum gas oils, and residuals. The unit is designed to operate independently when adjacent units are shut down.

A straight-run debutanizer is located on the crude and vacuum plot, and has been designed to process light straight-run gasoline from the desulfurizing section of the reforming and desulfurizing unit. By desulfurizing the combined SR gasoline and naphtha-overhead fraction, the necessity for treating the gasoline to the required specifications in a separate unit is avoided. In addition, this allows future production of a desulfurized jet-fuel cut. Alternately, the SR debutanizer is capable of stabilizing the crude-tower overhead for storage when either the reforming and desulfurizing unit or the alkylation unit is down.

Certain features have been incorporated to improve the general design and assure operational simplicity and stability. They include cleanliness and end-point control of the crude-tower side-stream products, positive-tray-wash and bottoms quench in the vacuum tower, and high thermal efficiency due to exchange with appropriate intermediate reflux and product streams. Proper consideration has been given to the design to assure a low metals-containing stock for catalytic cracking-unit feed and, in addition, allow this combination unit to operate independently when adjacent units are shut down.

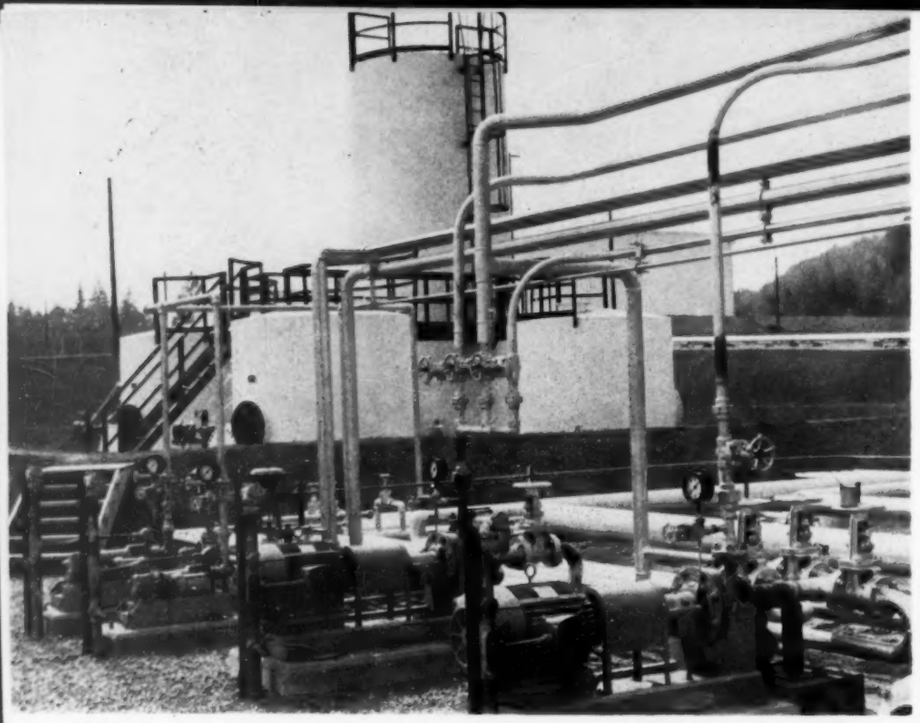
The Orthoflow® "B" catalytic cracking unit is the second of its type installed by B-A—the first having been at Clarkson in 1954. The regenerator is mounted over the reactor, resulting in capital and operating savings. The unit is capable of converting 9,000 b/sd of gas-oil blend received from the combination crude-topping and vacuum unit.

The distillate-desulfurization unit is designed to run, in blocked operation, 4,000 b/sd of FCCU light cycle oil, virgin wide-cut diesel oil, and virgin stove oil—all of which are produced while refining high-sulfur crudes.

Each feed will be desulfurized such that product from the unit will have no color degradation; the same boiling range as feed; and a sulfur weight-content 25% that of feed sulfur.

Product gas from the catalytic reforming unit provides the hydrogen required for desulfurization. Unit products besides treated gas oils are high-pressure separator gas, stripper gas, and stripper gasoline. The separator gas is routed to on-plot furnace firing only, and the stripper gas to the FCCU gas-compression system. The stripper gasoline goes to FCCU recovery when running light cycle, or to the crude-unit overhead system when running wide-cut diesel or stove oil.

Completed crude-processing unit at B-A's new Port Moody refinery.



In-line blender at Port Moody refinery utilizes an intricate system of meters, gauges, and memory devices to overcome the complex problems of gasoline blending.

Facilities include a reactor sized for desulfurization of light cycle at 700 F and 500 psig. A double-bed design permits quenching during desulfurization. The catalyst will be Peter Spence cobalt molybdate. Other facilities are a stripper to control product boiling range; a furnace; and two 50% capacity single-stage reciprocating compressors. The furnace will be used during reaction for feed preheat, and during blocked regeneration for steam-air preheat. The compressors will be used for feed gas plus recycle gas.

Plot space is provided for the possible future additions of a regeneration steam heater; a duplicate distillate-desulfurizer reactor; and a recycle-gas scrubber for removing H_2S from the recycle-gas stream.

The naphtha-desulfurizing unit is designed to desulfurize up to 7,200 b/sd, consisting of the 380-F EP and lighter fraction off the crude unit. The unit supplies a reformer feed; a light naphtha feed to the straight-run debutanizer of the crude unit; and a jet-fuel product stream.

Vapor from the HP separator is sent to fuel gas, and the vapor off the prefractionator tower to the FCCU recovery system. Facilities have been provided for the use of a maximum of 4,000 b/sd of stabilized naphtha feed from storage. Provisions have also been made for the future introduction of a stripper for the preparation of feed to an isomerization unit, and a rerun tower for the production of solvent from part of the reformer feed.

The reforming unit, terraced with the desulfurization unit at an elevation of 512 ft, is designed to process 4,000 b/sd of feed. The products from the unit consist of the 95 F-1 reformate, which can be either debutanized or stabilized; the C_2C_4 fraction of the alkylation unit; and off vapor sent to the FCCU recovery systems. The hydrogen-rich gas produced in the reforming reaction is used in the naphtha- and distillate-desulfurizing units, and the balance sent to the FCCU recovery system. Provisions have been made for the introduction of an additional reactor for the onstream regeneration.

The unit is designed to operate at either full or 60% capacity, while the reforming section can operate at either 400 or 500 psig at the inlet to the second reactor.

The alkylation unit is another "first" for B-A and B.C. Feed stocks are obtained mainly from the catalytic cracking and catalytic reforming units, and comprise liquid gases such as propylene, butylene, and amylenes. With *iso*butanes added, they are processed with sulfuric acid to produce motor alkylate, with a research octane number of 105 to 108, with 3.6 ml TEL. The unit is designed to produce 1,050 b/sd of this blending component.

The Kellogg cascade model-C reactor is used to produce the desired-quality alkylate with a minimum quantity of *iso*butane recycle from the *iso*butane tower. The reactor features instantaneous removal of heat of reaction as well as an intimate turbulent contact of *iso*butanes, unsaturates, and acid at the point of olefin feed. Provisions for separation of the acid from the reaction products is an additional feature.

In the Kellogg cascade process, olefin-bearing liquid feed is cooled and contacted with an excess of *iso*butane in the presence of sulfuric-acid catalyst. The olefin feed is split into parallel streams and charged to each reaction zone of the cascade system. *Iso*butane-rich recycle and refrigerant are introduced into the first reaction zone only, and passing series through successive zones to provide the necessary excess *iso*butane. Series flow of *iso*butane recycle and acid catalyst with parallel flow of olefin feed is a novel design feature of the Kellogg cascade reactor. In this manner, the entire *iso*butane recycle stream plus the *iso*butane-rich refrigerant stream is contacted with only a fraction of the olefin feed stream in each reaction compartment. This arrangement creates a high *iso*butane concentration and a high *iso*butane-olefin ratio in each stage, thereby establishing optimum conditions for maximum production of high-quality alkylate with a minimum quantity of *iso*butane recycle.

Reaction products, excess *iso*butane, and inert components of the feed are separated from the acid catalyst in the settling zone and charged to fractionation equipment for separation of the *iso*butane recycle. Normal butane, which does not take part in the reaction, is then fractionated from the alkylate product. Heavy polymers produced are separated from the desirable alkylate in the return tower; *iso*butane recycle is returned to the first reaction zone of the reactor; and normal butane is withdrawn to product storage.

Vapor resulting from the removal of the exothermic heat of reaction is compressed, condensed, and the liquid returned to the reactor as refrigerant. This stream is predominantly *iso*butane; however, its propane content is higher than elsewhere in the process. A portion is, therefore, diverted to a depropanizer tower for removal of propane from this system.

Sulfuric-acid catalyst is recirculated through the reactor to maintain acid concentration and, as contaminants build up, a portion is withdrawn and replaced by fresh acid.

Acidic material entrained in the effluent hydrocarbons is removed by effluent treater.

Prior to charging to the crude-topping and vacuum unit, all crude oils are treated through a chemical desalting unit. Inorganic salts removal is approximately 95% to 100% complete.

Catalytically cracked gasoline is caustic-

treated through an electrical distillate treater to remove sulfur and phenolic compounds—thereby improving storage stability and clean-burning properties of the gasoline.

Thorough planning has been applied to waste disposal. Air pollution has been studied by a leading expert who surveyed the refinery site and submitted an exhaustive report which was used in the design of refinery equipment. The flare stack, of smokeless design, is 249 ft high and 42 in. in diameter.

The second type of pollution carefully considered is that which might affect the water of Burrard Inlet. Complete sewage systems have been installed throughout the refinery area. These include storm sewers, domestic sewers, oily-water sewers, foul-condensate sewers. The foul condensate is stripped of hydrogen sulfide and other contaminants.

Oil collected in the oily-water sewer system from the unit areas is largely removed by an API-type separator. The relatively clean water is then passed to the holding basin, where the remaining oil is removed. The resulting clean effluent is passed through a 24-in. line to a distance of 320 ft into Burrard Inlet. At a depth of 25 ft, it is dispersed into the water by means of a special diffuser.

In order to be able to keep a permanent check on any possibility of water pollution, a biological survey was carried out by a consulting biologist. The principle is that a study is made of existing life—even the one-celled plants and animals—living in the water before the refinery goes into operation; then, if there is any interference with this water life, the source of pollution can be traced and its severity correctly estimated. Aside from this survey, other independent chemical laboratory analyses of Burrard Inlet water have been made to determine the degree of pollution now present.

Tankage facilities include 13 crude-oil and gasoline tanks, capable of holding 617,500 bbl of product. All have been equipped with floating-roof tanks.

Crude-oil supplies for the refinery will come from western Canada, and initial transportation will be through the Trans Mountain Pipe Line from Edmonton to Burnaby. Some two miles of 12-in. branch pipeline have been constructed from the main tank farm at Burnaby to the refinery. Assisted by a 100-hp booster station, this branch line is capable of supplying the refinery with 80,000 b/d of crude.

Electricity is delivered at high voltage, 60,000 volts, to the refinery by the British Columbia Electric Railway, and is lowered to 4,160 volts in a 7,500-kva transformer. Steam is supplied by two high-pressure 625 psi 750-F boilers with a capacity of 166,500 lb per hour. One of the boilers is of a conventional type, and can produce 81,500 lb per hour of steam. The other is a carbon-monoxide type with a capacity of 85,000 lb per hour. This latter boiler will obtain about 30% of its heat requirement by burning catalytic cracker stack gases. It is the first boiler of its type installed in British Columbia, although B-A has a similar boiler at its Montreal refinery. Operating pressures of the boilers are the highest at any of B-A refineries.

Water is supplied through some 20,000 ft of 10-in. to 14-in. pipeline laid down through the city of Port Moody from city mains. The capacity of this water system, which includes two 125-hp booster-station pumps is 3,500,000 gal per day. The cooling tower is made of western red cedar, and its circulating pumps have a capacity of 25 million gallons per day. Use of this type of cooling tower reduces to a minimum the oil content of the waste water drained into Burrard Inlet.

Particularly interesting is the completely electronic gauging system. Port Moody has installed remote-control automatic gauging facilities which will permit dialing a tank number for the correct quantity and temperature of the product stored. This automatic gauging equipment is the first of its kind ever installed in Canada to cover a complete refinery. Similarly, the refinery has automatic blending facilities.

Apart from the technological buildings, there is an administration building and cafeteria. The cafeteria is fitted with picture windows looking out toward the snow-capped mountains.

Other buildings include an operations building, a laboratory, a change-house and lunchroom, storehouse and machine shops, a blending building, and a gate house.

To level the area, 1,000,000 cu yd of earth had to be moved. Under the direction of local experts, landscaping has been carried out. There are 750,000 sq ft of tank dykes and lawns seeded to grass.

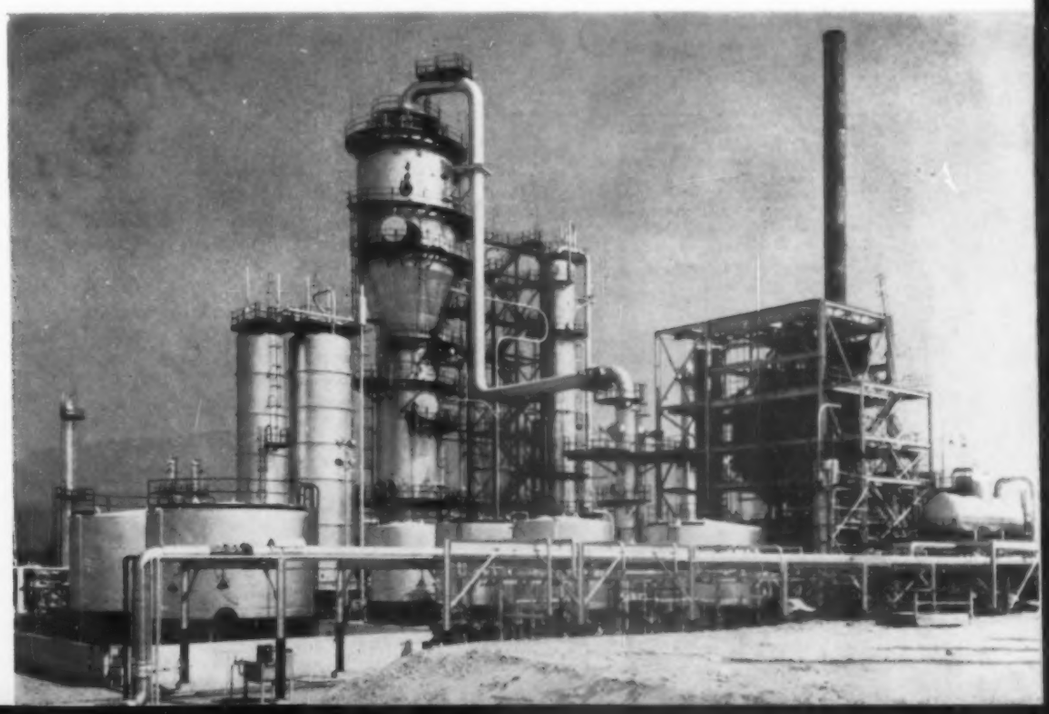
The new refinery will greatly augment B-A's already important operations on the West Coast. More than that, the refinery will be significant in the development of the West.

B-A, which first entered British Columbia in 1935 as a marketer of petroleum products, now has about 550 dealers and service stations throughout the province. B-A has an important marine business, operating a large tanker and some barges to serve the fishing fleets, lumber camps, and industries otherwise difficult of access.

A mile from the new refinery is the Port Moody bulk plant, which handles lubricating oils, greases, and drum goods of light oils. This plant is housed in the old CPR ticket office, and the B-A dock was once used by sailing ships carrying steel to finish the railway line.

Two other terminals at Coal Harbor and Burnaby handle products for distribution to the Vancouver area, to agencies and distributors.

The new Port Moody refinery marks an important step forward in B-A's British Coumbia development, and underlines the company's confidence in the province's future. END



Catalytic cracking unit at Port Moody with carbon-monoxide boiler at right.

Fig. 1 Some of the automatic instruments used at Dowell's research laboratory in Tulsa.

Automation in the research laboratory

by C. M. Maddin* and R. B. Rosene*

MECHANIZATION and automation are popular terms in today's business and industrial world. However, the usefulness of mechanical and electronic wizardry is not confined to the production line. Research and development organizations in all branches of science are turning to instrumentation in solving their problems. Instrumentation is to the research program what automation is to the industrial production line. Analyses which were formerly laborious and time-consuming can now be performed with fewer personnel and in less time by the use of instruments which utilize recent electronic and physical advances.

The proper use of instruments results in increased efficiency, more rapid problem solving, and greater accuracy and reproducibility. Instrumentation has been applied by Dowel to the field of petroleum research, with emphasis on production problems. Projects undertaken in Dowell laboratories over the past few years illustrate application of the following areas of instrumentation: X-ray diffractometry, emission spectography, interferometry, spectrophotometry, metallography, and electron microscopy (Fig. 1).

X-ray Diffractometry: One of the most versatile analytical instruments available is the X-ray diffraction unit (Fig. 2). Both qualitative and quantitative analyses can be performed with a high degree of accuracy, giving information on how the elements are combined in a variety of materials. One limitation of the method is that the sample must be crystalline, although in some cases noncrystalline samples can be converted into a crystalline state by careful heating. Analyses of cores, cuttings, and samples of scale deposits from industrial units to be cleaned represent typical applications for X-ray diffraction work.

Normally, analysis of only a few cores and cuttings from the pay zone of a well is necessary to predict the most effective type of well-stimulation treatment. One recent project, however, required complete X-ray diffraction analyses of a large number of cores from six wells in a pool. This work involved both quantitative and qualitative analyses which were correlated with hydrochloric- and hydrofluoric-acid solubilities of the samples. A summary of the analytical results obtained on one of the wells is shown in Fig. 3.

The efficiency of today's techniques of chemically removing scale deposits from industrial or refinery equipment is largely due to better knowledge of the chemical constituents of the scales to be removed.[1] X-ray diffraction has proved to be an invaluable method of analyzing scale-deposit

* Dowell Division of The Dow Chemical Co., Tulsa, Okla.

Dr. C. M. MADDIN, laboratory group leader in the research department at Dowell Division of The Dow Chemical Co., Tulsa, Okla., was born in Vernon Texas. He received both his B.A. and Ph.D. degrees from the University of Texas, having obtained the latter in 1953. He majored in analytical chemistry, with emphasis on spectrography. He joined Dowell as an analytical chemist in 1953, and was promoted to his present position in 1954.

Dr. R. B. ROSENE, laboratory director at the Dowell Division of The Dow Chemical Co., Tulsa, Okla., was born in Novelty, Wash. He received his bachelor's degree from Whittier College in 1944, and his Ph.D. from Purdue in 1951. He was research chemist for Plantation Division, U. S. Rubber Co., on its Far Eastern plantation in Sumatra from 1951-52. He then joined Dowell as research chemist, and shortly thereafter was promoted to group leader. He attained his present position in 1954.

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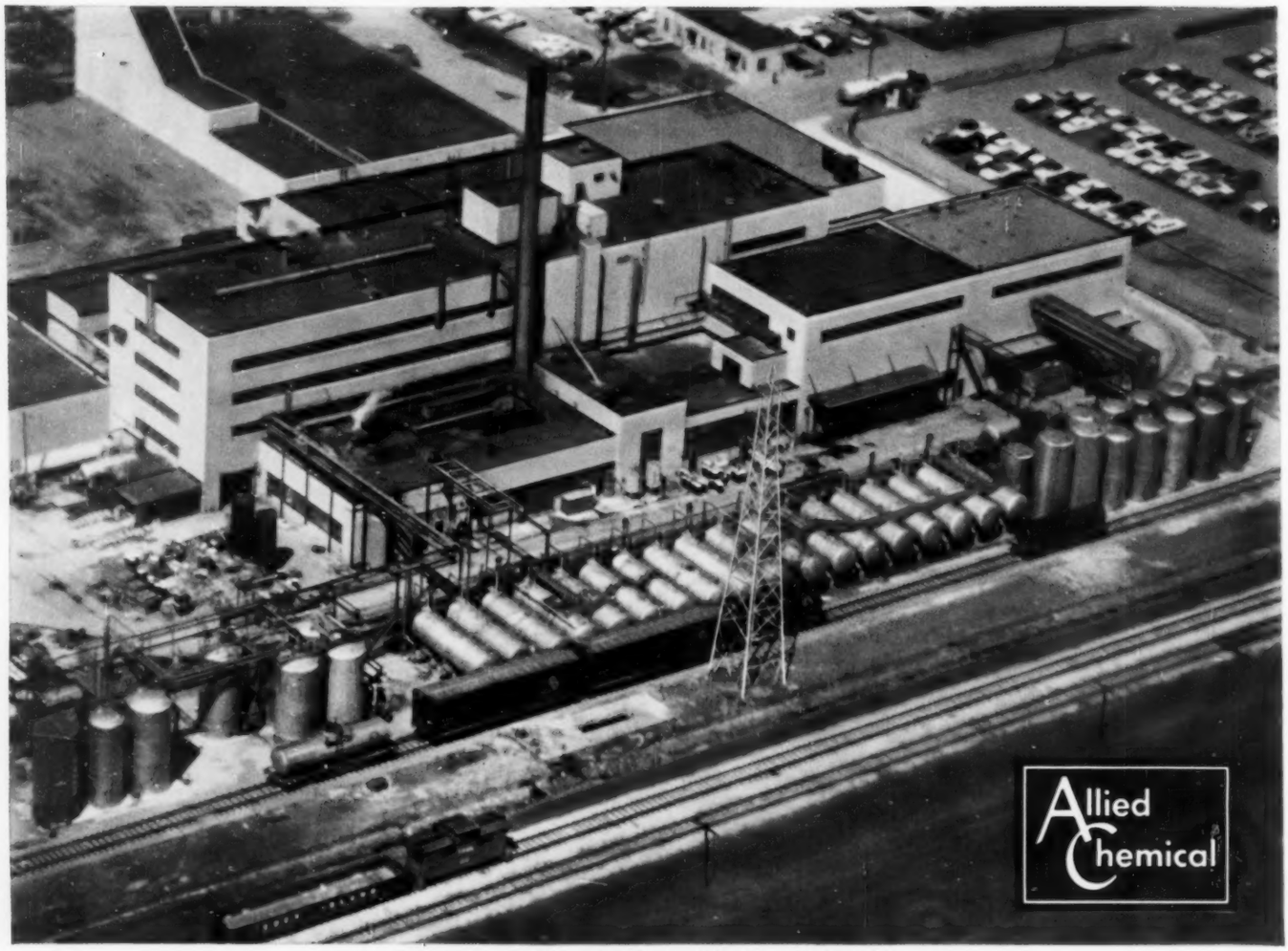

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samples. Typical boiler deposits identifiable by this method include:

Name	*Formula*
Acmite	$Na_2O \cdot Fe_2O_3 \cdot 4SiO_2$
Analcite	$Na_2O \cdot Al_2O_3 \cdot 4SiO_2 \cdot 2H_2O$
Pectolite	$Na_2O \cdot 4CaO \cdot 6SiO_2 \cdot H_2O$
Hydroxyapatite	$Ca_{10}(OH)_2(PO_4)_6$
Serpentine	$3MgO \cdot 2SiO_2 \cdot H_2O$
Hematite	Fe_2O_3
Magnetite	Fe_3O_4
Copper	Cu
Alpha quartz	SiO_2

Numerous deposits which lower refinery efficiency can be identified by X-ray diffraction techniques. Deposits found on the water side of refinery heat-exchange equipment include carbonates, silicates, oxides, phosphates, and organic material (algae and bacteria). On the product side are found oil, partly polymerized oil, carbonized organic matter, crude-oil salts, sulfides and oxides, and residues from special processes.[2] X-ray diffraction analyses of deposits such as these are useful in planning chemical cleaning operations. They also provide nuclei for research projects leading to development of suitable solvents for deposits which are particularly difficult to remove.

Emission Spectography: Some time ago the need for a more rapid and complete identification of oil- and gas-well formation waters arose. The emission spectograph (Fig. 4, at right) was found to be especially adapted to handling this problem because the charactertistic constituents of brines are the metallic ions. The spectograph provides a fast, specific, and sensitive method of analysis for metallic elements, especially when they are in low concentrations.

Brine analysis involves adding an internal standard solution to a sample of the brine. The sample is then subjected to a high-voltage spark, and the spectrum of the elements present is recorded on a photographic plate. Calcium and magnesium are the major elements determined; while barium, strontium, iron, manganese, and boron are measured in trace amounts.[3]

Analysis of scale deposits by X-ray diffractometry, prior to chemical cleaning, has been previously discussed. The efficiency of the cleaning treatment can be determined by analyzing the drained solvent after the treatment and comparing it with the X-ray analysis of the deposit. This solvent analysis is made using techniques similar to those employed in brine identification. The elemental analysis is correlated with the various compounds in the scale sample, as indicated by the X-ray data.

The emission spectograph has found use in other production research applications. These include: (1) correlation of formations from different areas by core analysis; (2) estimation of extent of corrosion in tubing through analysis of produced fluids (both water and oil) for iron content; (3) determination of cause of corrosion. This last application often involves the analysis of minute quantities of corrosion products found in pits in tubing. Refineries find the spectograph almost indispensable in detecting small quantities of complexed metals, which may be catalyst poisons in crude-oil samples. The spectograph may be used for the analysis of catalyst feed stocks, as well as for providing quality control of special additives in lubricating oils.

Interferometry: The use of additives in water-flooding techniques has often been investigated. Studies of this subject have been concerned chiefly with the action of surface-active agents in displacing oil from petroleum-bearing surfaces. There seems to be a definite correlation between the amount of petroleum displaced and the quantity of surface-active agent adsorbed. The extent of adsorption is an important factor in the agent's use, because it is necessary to consider the amount of the

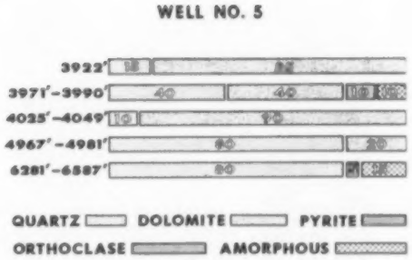


Fig. 3 Summary of analytical results obtained from a well where cores had been subjected to X-ray diffraction analysis.

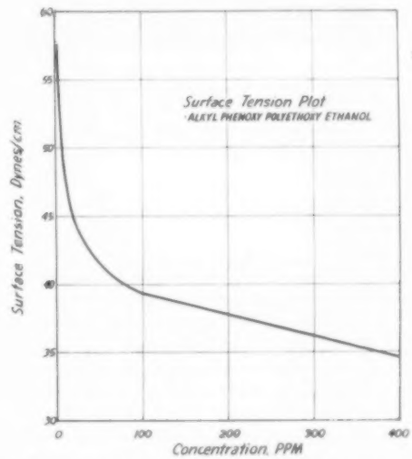


Fig. 5 Surface tensions determined by the interferometer.

Fig. 4 The emission spectrograph (right) provides a more rapid and complete identification of oil- and gas-well formation waters.

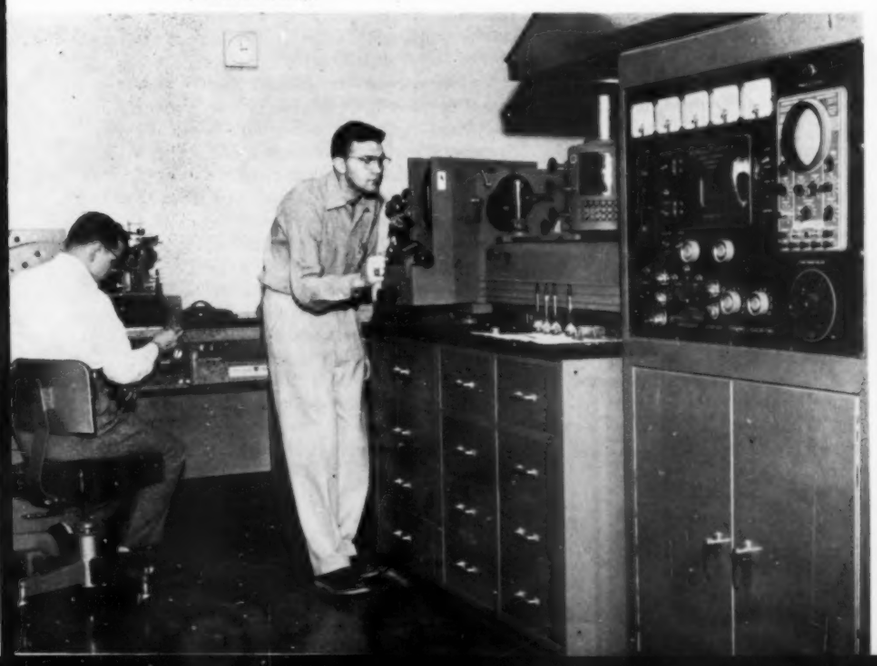
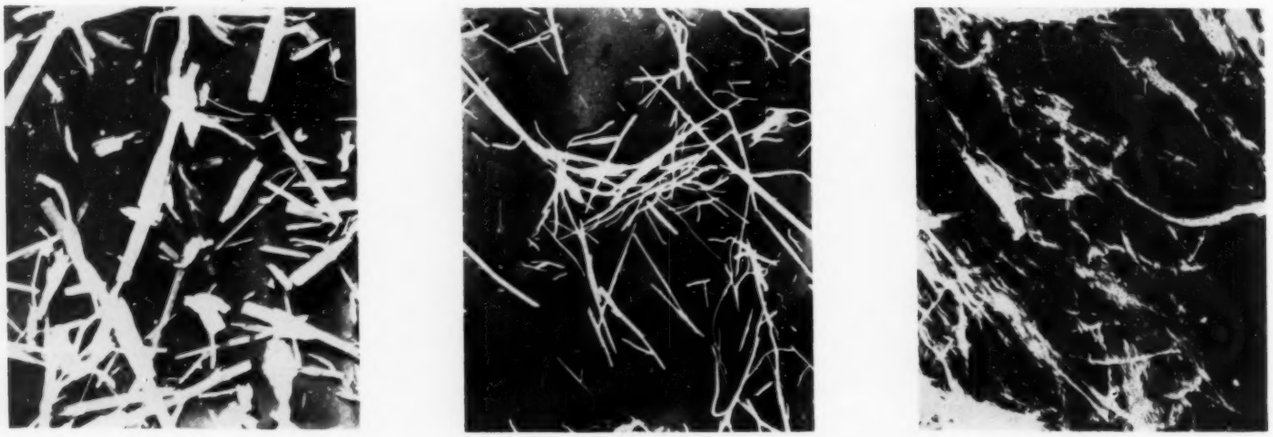


Fig. 2 The X-ray diffraction unit is one of the most versatile analytical instruments.

CORRELATION OF PHYSICAL PROPERTIES OF THICKENING AGENTS TO THEIR ELECTRON MICROGRAPHS



	A	B	C
Fluid Loss	400ml./5 min.	300ml./30 min.	50 ml./30 min.
Viscosity	10 cps.	400 cps.	100 cps.
Sand Falling Rate	5 ft./min.	Less than 0.5 ft./min.	Less than 0.5 ft./min.

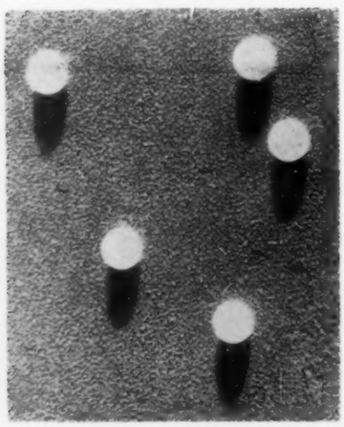
Fig. 8 Electron micrographs used in correlating the structure of thickened crude oils with their physical properties.

agent adsorbed on nonoil-bearing surfaces as well as on those containing oil.

A major problem was how to determine accurately the changes in concentration of the surface-active agent in various solutions. These concentration changes can then be related to adsorption of the agent. The changes could not be determined accurately by direct surface-tension measurements because fairly large changes in agent concentration (100 to 1,000 ppm) had little effect on surface tension, as indicated in Fig. 5.

An interferometer, which measures difference in refractive indices of two liquids as a function of concentration, was used. It is applicable to materials of widely differing compositions and sensitive enough to detect small changes in concentration. Adsorption measurements made with the interferometer corresponded very closely with those made by other investigators under similar conditions.[4] Results showed that surface-active agents must go through an adsorption process in order to displace petroleum. The efficiency of such agents in displacing petroleum was greatest with materials which were adsorbed in greatest quantity by oil-bearing surfaces. In addition to this use, the interferometer can be used with any system, liquid or gas, in which differences in refractive indices are significant.

Fig. 9 Electron micrograph of latex particles.



Spectrophotometry: In studying acid inhibitors, aspects of the mechanisms involved in metal protection were examined through experimental physics. Special equipment was built to measure the electrical resistance of an adsorbed inhibitor film. In one such case, results indicated a film-forming period, a film-stability period, and a film-decomposition period. To test the validity of this theory, determinations of dissolved iron at given time intervals were made. A spectrophotometric method sensitive to about one-half part per million of iron was used. By using this instrument, these determinations were made accurately and quickly. The results obtained closely paralleled the findings by resistance measurements.

Infrared and ultraviolet spectrophotometry are probably used most often in petroleum research projects. These tools are useful in studying organic chemicals because they provide a convenient method for structurally classifying newly synthesized compounds. Examples which illustrate this use include: (1) structural classification of wetting agents, corrosion inhibitors, and special solvents; (2) quantitative determination of corrosion inhibitors in produced well fluids, following special injection procedures; (3) quality control of the products used in chemical services to industry. Petrochemical manufacturers have also found infrared spectrophotometry very useful in establishing automatic controls on process streams.

Completely identifying materials by their infrared spectra requires the use of spectra of a large number of known materials for comparison. These known spectra are compared with those of unknown materials by means of an IBM card system which locates spectra corresponding to the unknown. This is done by preparing a card for each reference spectrum, then sorting the cards with an IBM collator. The collator and switchboard combination sorts the cards at a rate of 480 per minute, selecting those corresponding closest to the unknown material. With more than 8,000 reference spectra available, such an automatic sorting device is necessary. Sorting is further simplified by color-coding the cards to correspond to definite classes of compounds such as inorganic, solid, and liquid compounds.

Metallography: Corrosion problems arise in all phases of the petroleum industry. Corrosion usually can be controlled best by first finding its cause. The application of emission spectography in measuring the extent of oil-well corrosion by determination of the iron content of produced fluids has already been mentioned. Indentification of corrosion products in pits or grooves in tubing, casing, or other equipment by X-ray diffraction techniques has proved to be very helpful. Instrumental methods of analysis are necessary in this type of work because only small samples are available. A sample weighing only a few milligrams could easily be the key to a major corrosion problem. It is essential to be able to distinguish between the many different forms of iron oxide (such as magnetite and hematite) which are found in pits or grooves.

Along with an analysis of corrosion products, consideration of the metal structure in and around the point of attack is essen-

tial to understanding the particular corrosion problem. A metallograph provides a photomicrograph of the metal structure. Magnification up to 2,000 power can be obtained with the model shown at left in Fig. 4. Time required to obtain a satisfactory negative is one-half to two seconds, as compared with the five to thirty minutes required by conventional methods employing a regular monocular microscope and an incandescent light source. Some examples of differing metal structures are shown in Fig. 6 and Fig. 7. A metal's abnormal cyrstal structure and data on its corrosion products are guides to understanding the cause of corrosion.

Electron Microscopy: Formation fracturing is a significant recent advance in petoleum production. This process requires the introduction of a fluid medium, containing a propping agent such as sand, into a well bore at high velocities and high pressures. The fluid medium is frequently an oil-base material, such as a thickened crude oil. Results of the fracturing treatment are generally dependent on its properties. Such properties as fluid loss, gel strength, and temperature stability are important in evaluating thickened crude oils. These properties were observed to differ in a series of similar chemical thickening agents. To understand these differences, a study of the ultramicrostructure of the thickened crude oils was conducted by the use of electron microscopy.

The electron microscope is capable of an ultimate resolution of about 20 angstroms and direct magnification to 80,000 diameters. Magnification of 12,000 power was adequate for this work. Electron micrographs were useful in correlating the structure of the thickened crude oils with their physical properties, as illustrated in Fig. 8. Continuation of these studies should lead to a better understanding of the properties of fracturing fluids and result in better methods of increasing production through fracturing.

The electron microscope is particularly useful for making particle-size measurements. A recent research project involved developing a specialized material for controlling the fluid loss of a gel-type fracturing fluid. Particles as small as 100 angstroms in diameter were observed with the electron microscope.

In the development of a latex cement, it was found that its physical properties, such as tensile and compressive strengths, depended to some degree on the particle size of the latex used. Measuring particle size by reflectance spectrophotometry was difficult because adequate standards were not available. The high magnification provided by the electron microscope made it an excellent tool for this project. A typical electron micrograph is shown in Fig. 9.

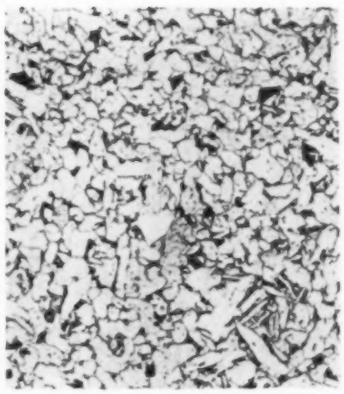
These latex particles were coated with gold under a high vacuum to increase contrast and provide an electron micrograph with three-dimensional qualities. The apparent "shadow" is an area not coated by gold, due to interference by the latex particles. The shape of the "shadow" yields information about the shape of the particle, and in this case indicates that the particle was spherical.

Identifying clays, such as may be found in producing formations, can often be accomplished by electron microscopy. Halloysite, for example, would be difficult to identify by other methods.

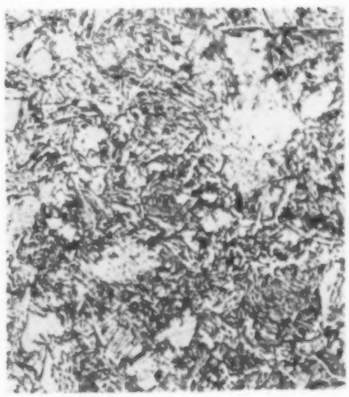
Conclusion: Using an instrument or machine to solve a problem or perform a task, whether in the laboratory or factory, can be justified only on the basis of improved performance. Its use should result in doing a job faster, with fewer workers, or at a lower cost. This is particularly true when time is of prime importance. The foregoing examples have been chosen to show where the use of instruments has aided in these three respects. Wide use of instruments enables a company with a small to medium-sized laboratory to perform large-scale research projects.

A research program geared to maximum use of instruments will return dividends to the company in the form of stepped-up results. This is especially true in times such as these, when well-trained scientific personnel are at a premium.

CRYSTAL STRUCTURE OF CARBON STEELS



Pearlite Ferrite
High-Corrosion Resistance



Martensite
Low-Corrosion Resistance

Fig. 6 and 7 Metallographic photos permit study of differing metal structures.

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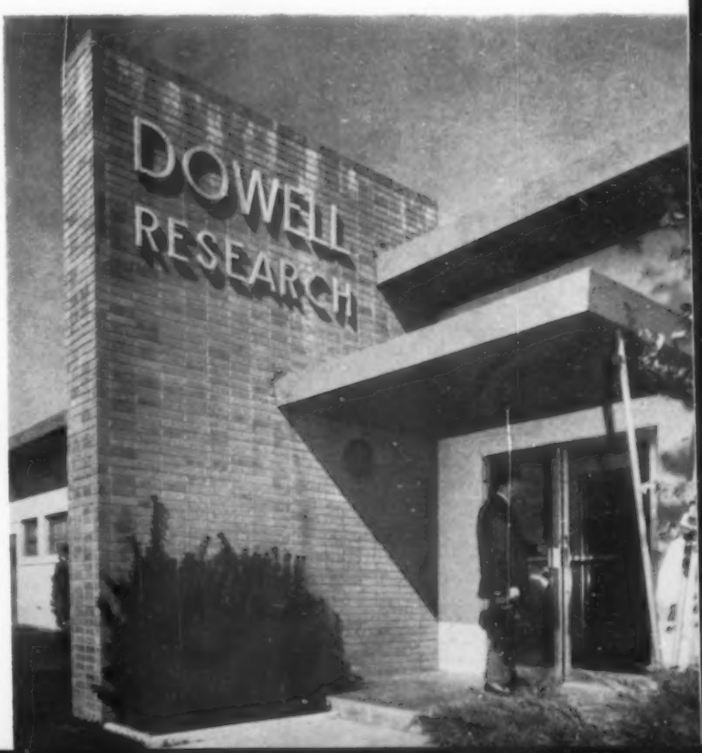


Entrance to Dowell's Tulsa research laboratory.

ETHYL RESEARCH APPRAISES VOLATILITY PROBLEMS OF FUTURE FUELS

Another important phase of octane improvement cost studies which must be balanced with engine requirements

Volatility cannot be separated from octane improvement cost studies of present day and future fuels. Exactly how much effect volatility will have upon cost studies will depend upon the individual refining situation and the value and/or availability of various pressurizing materials.

Studies in this field show that volatility is frequently a limiting factor in fuel composition.

Volatility and Engine Appetite

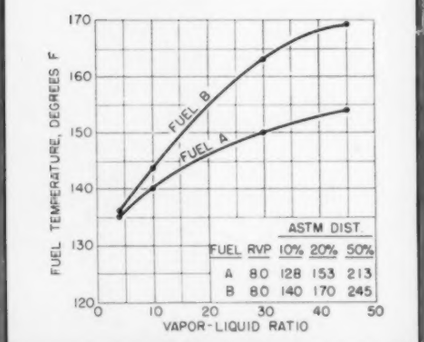
The importance of volatility as it relates to cost of octane improvement cannot be minimized. Yet engine acceptance of proposed volatility specifications must be given careful consideration. This is not always a straightforward comparison with previously marketed products.

Studies of refining trends made by Ethyl engineers indicate that volatility control of future fuels may become a subject for very careful appraisal as it relates to satisfactory engine performance.

Refining Trend— To More Aromatics

The refining trend within the next few years is toward higher aromatic fuels. Refinery practices such as splitting reformate, extraction of aromatics, and allocating more feed to the reformer all will be contributing factors. As more aromatics are blended to gasoline, there is an attendant decrease of mid-volatility

FIG. 1
EFFECT OF ASTM DISTILLATION ON THE VAPOR-FORMING CHARACTERISTICS OF GASOLINE



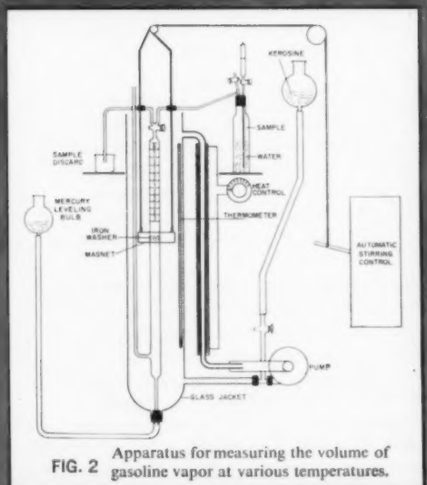


FIG. 2 Apparatus for measuring the volume of gasoline vapor at various temperatures.

ETHYL'S SAN BERNARDINO LABORATORY is ideally situated and well equipped for general studies of fuel volatility. Maximum daytime temperatures near 100°F. prevail throughout the long summers. Suitable test roads are available at various altitudes.

as shown by the ASTM distillation curve.

Ethyl experience has shown that this frequently will hamper warm-up characteristics of today's engines. *Warm-up* has been given very careful consideration in Ethyl fuel studies since this is a vital aspect of mid-volatility.

Very often mid-volatility problems will require complete rebuilding of the fuel with maximum use of light blending components such as iso-pentane.

Precautions with Iso-Pentane

From the standpoint of engine acceptance, iso-pentane must be carefully appraised. Vapor lock is probably the most important single factor that must be considered. Vapor formation proceeds at a very rapid rate in fuels that are pressurized with large quantities of less volatile pentane, once designed-for fuel temperatures are exceeded.

An evaluation must be made for any volatility change. However, more care must be exercised in the control of a pentane-pressurized fuel than one adjusted with butane since more severe vapor locking difficulties can result during unseasonably hot weather.

Can Vapor Lock Tendencies Be Estimated?

The rates of vapor formation at various temperatures determine the relative vapor locking tendencies of gasolines. Vapor formation is not necessarily related to Reid vapor pressure alone.

One method of arriving at this information is shown in Fig. 1. Two fuels of the same Reid vapor pressure but different ASTM distillation curves are indicated. Fuel A produced 30 volumes of vapor per volume of liquid at 150°F., whereas Fuel B formed only 16 volumes at the same temperature.

The above type information (temperature V/L values) may be calculated from usual gasoline inspection data using Coordinating Research Council procedures.

Experience may then relate the temperature—V/L values to vapor locking tendencies of cars under seasonal conditions for the area of interest. Such an appraisal permits a more accurate specification of desired front-end volatility.

Frequently it is necessary to cross-check temperature V/L values of fuels having unusual distillation characteristics by an experimental procedure. Apparatus for such laboratory work is described in Fig. 2. This equipment is available at the San Bernardino branch of Ethyl Corporation's Research Laboratories.

Other facilities there include a gasoline testing laboratory, and a chassis dynamometer which operates under controlled temperature, wind and velocity conditions. Ethyl Technical personnel have frequently used these facilities in cooperation with refiners for studies of their gasoline volatility problems.

HOW ETHYL RESEARCH IS HELPING YOU

The Refining Industry is constantly studying volatility of future fuels as it relates to octane improvement.

Ethyl Corporation Refinery Technologists have recently made a precise study of butane and pentane to establish the octane blending values of these pressurizing agents in several refinery stocks.

Refining trends indicate that isopentane will find a position in future fuels for octane improvement and volatility control. Future fuel volatility should be carefully appraised from the standpoint of engine acceptance. Assistance in such studies, based on over 30 years' experience in fuel-engine relationships, is available from Ethyl's Research Laboratories.

For further information, just call your Ethyl Representative.

ETHYL CORPORATION
New York 17, N. Y.

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ETHYL CORPORATION

RESEARCH LABORATORIES:
1600 W. Eight Mile Road, Ferndale 20, Mich.
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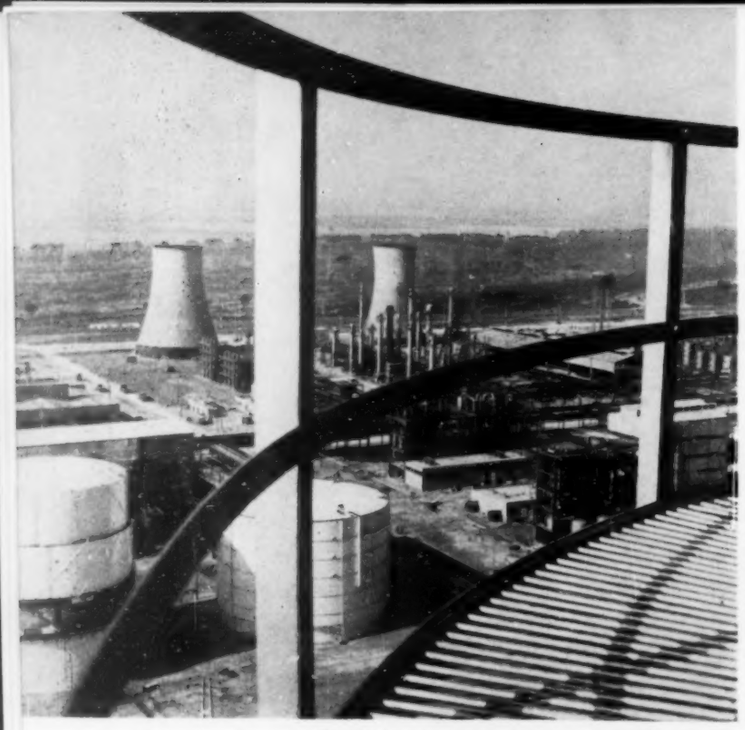
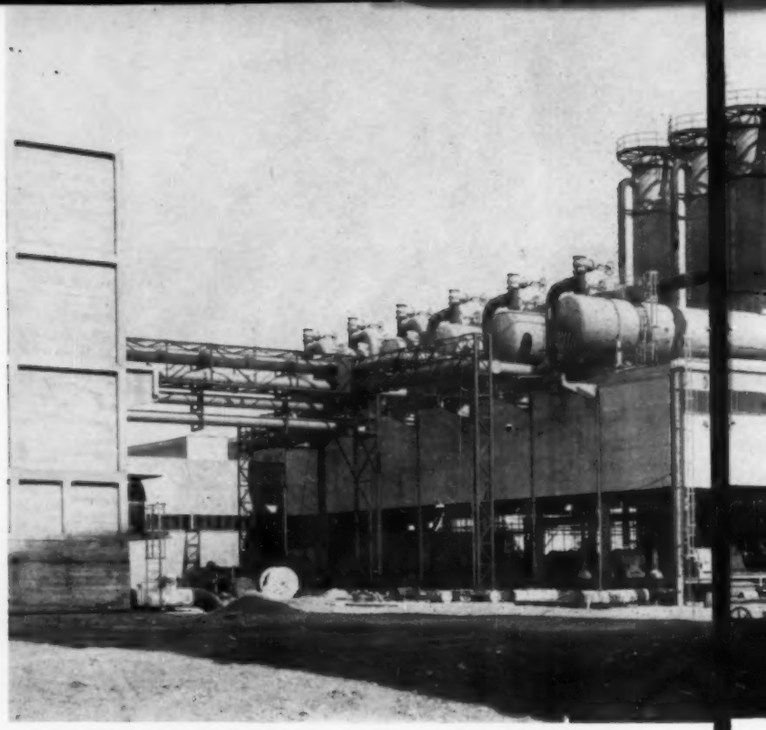


Partial view of oxygen and nitrogen gas holders, air fractionation unit, and water-treating facilities. (Note: All photos in this article by courtesy of ENI).



Gas-purification and recovery unit.

Petrochemicals in Italy

ANIC works near Ravenna adds 750,000 tons per year of nitrogen fertilizers and 35,000 tons of butadiene to Italian output. Petrochemical expansion is based on Po valley gas development

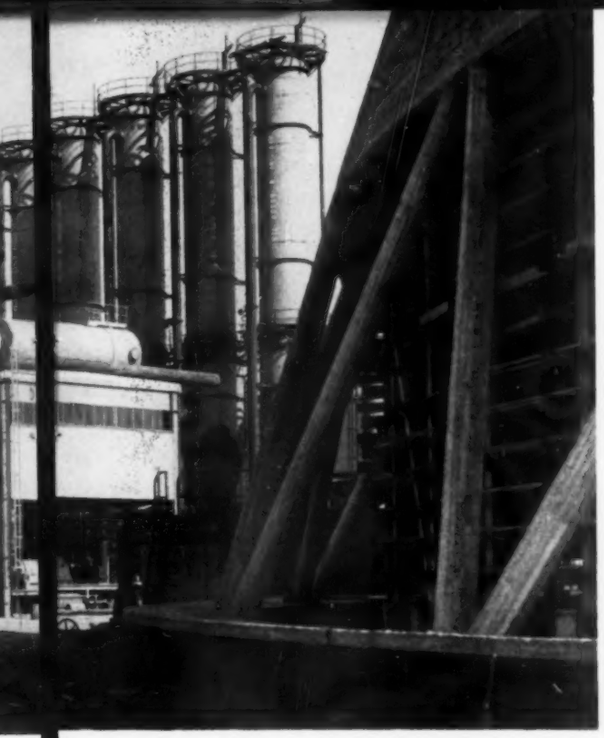
THE DEVELOPMENT of a petrochemical industry in Italy began in the immediate postwar years. Its growth has been quick and steady despite the relatively scarce availability of raw materials.

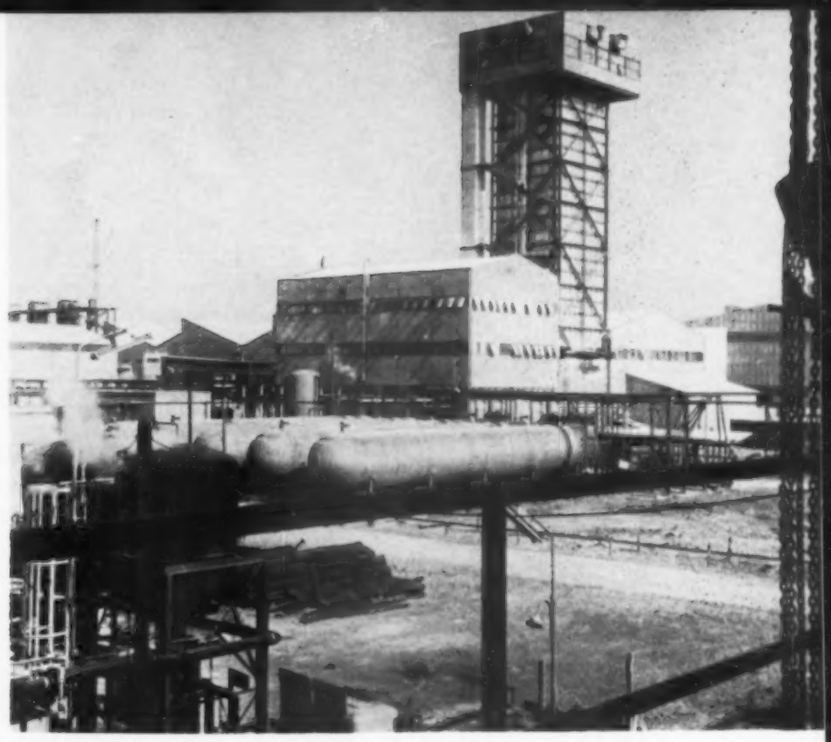
Traditionally deprived of the raw materials on which a petrochemical industry can be based, viz., oil and natural gas, Italy started a substantial activity in this field after the discovery in the Po valley of natural-gas reserves, conservatively estimated at about 100 billion cubic meters. Yearly production of natural gas in this area is presently slightly above four billion cubic meters.

Commercial exploitation of natural gas for chemical synthesis in Italy was started by Montecatini with the production of ammonia, nitrogen fertilizers, acetylene, and oxygenated products. Other undertakings have been the entrance of other private companies (Edison, SISAS) and later, on a substantially larger scale, of the government hydrocarbon agency ENI, through the chemical subsidiary ANIC, a joint private-State company, originally incorporated in 1936 for the production of synthetic motor fuels by high-pressure hydrogenation.

ANIC currently handles all the petrochemical activities of the ENI group and coordinates the activity of the refineries which are jointly owned companies of the ENI group and private companies (Stanic refineries in Bari and Leghorn, IROM in Venice, Stoi in Florence).

A project developed by ANIC management, jointly with other companies, back in 1952 considered the manufacture of synthetic rubber from C_4-hydrocarbons. The





Ammonia nitrate plant, with granulation tower in background.

C_4 production from the refineries at that time, however, was rather scattered, and a quantity of C_4-hydrocarbon sufficient to feed the butadiene plant could not be gathered from the refineries close enough to the projected plant.

After ANIC had entered the ENI group, the project was completely changed. The new plan was based on natural gas as the raw material; it considered combining the production of butadiene and synthetic rubber with the utilization of byproducts, hydrogen, and carbon monoxide for the manufacture of nitrogen fertilizers.

The capacity of ANIC works, erected near Ravenna in the eastern Po valley, not far from the Adriatic Sea coast during the past two years was set at 750,000 metric tons per year of nitrogen-containing fertilizers and 35,000 tons per year of butadiene-styrene rubber. A further addition of rubber-production capacity, based on the production of butadiene from C_4-hydrocarbons, is also being considered.

The Ravenna works, placed onstream a few months ago, is a conspicuous example of the possibilities offered by modern technology to the chemical utilization of hydrocarbons.

The integrated operative cycle is based on natural gas and air as the raw materials. Twin Linde low-temperature fractionation units, working at low pressure, can produce 99.98% pure nitrogen and 98% pure oxygen. Oxygen is compressed, and joins methane in acetylene burners, where reaction to CH≡CH is carried out at 1,700 C; reaction products are immediately quenched down to 80 C with water. From this step, a mixture of gases is obtained—composed mainly of acetylene, hydrogen, and carbon monoxide. The former is the intermediate for rubber; the latter are the raw materials for nitrogen fertilizers.

Separation of acetylene from its homologs, and from the carbon monoxide-hydrogen mixture, is done in the fractionation unit; reacted gases are washed with solvent which absorbs the heavier components; the overhead gases are further scrubbed at low temperature. Acetylene homologs and part of the acetylene itself are absorbed. Residual gases contain mainly hydrogen, carbon monoxide, carbon dioxide, and part of the acetylene. The latter is recovered by further low-temperature solvent absorption.

Overhead gas from this operation is sent to the fertilizer section.

Solvents from the two latest operations are stripped to the lighter entrained gases, which are flared or burned at the plant furnaces. Acetylene is recovered and freed from entrained liquids in low-temperature coolers.

Purified acetylene is compressed and charged to stainless-steel vertical reactors containing an aqueous slurry of mercuric sulfate, in the presence of ferric sulfate and metallic mercury. Acetylene is bubbled through the liquid phase, and is partly converted to acetic aldehyde; crotonic aldehyde and acetic acid are formed as byproducts.

Vapors from the reactors—which contain acetaldehyde, unreacted acetylene, steam, and minor amounts of byproducts—are cooled and scrubbed with water to absorb the aldehyde.

The aldehyde solution is separated from water by distillation; crotonic aldehyde is separated from recovered acetaldehyde, which is condensed and degassed to eliminate traces of acetylene, and then stored.

Acetaldehyde is partly hydrogenated to ethyl alcohol. Butadiene is produced through condensation—dehydration of these two compounds over silica-gel catalyst impregnated with tantalum oxide. This process is based on early research of the Russian chemists Lebedev and Ostromisslensky, during World War I. They obtained butadiene through the following reactions:

$$C_2H_5OH \longrightarrow CH_3CHO + H_2$$

$$CH_3CHO + C_2H_5OH \longrightarrow CH_2{:}CH{-}CH{:}CH_2 \text{ (Lebedev}^1\text{)}$$

$$2CH_3CHO \longrightarrow CH_3CH{:}CHCHO + H_2O$$

$$CH_3CH{:}CHCHO + C_2H_5OH \dashrightarrow CH_2{:}CH{-}CH{:}CH_2 + CH_3CHO + H_2O \text{ (Ostromisslensky}^2\text{)}$$

Synthesis-gas compressors manufactured by Nuovo Pignone, an ENI subsidiary for petroleum machinery and plant construction.

The original process was developed and commercialized in the USA by the Union Carbide Co. in 1941-42[3].

Both the acetadehyde-partial hydrogenation and the condensation to butadiene are carried out on catalytic masses, in tubular reactors. Temperature control is obtained by "Dowtherm" circulation outside the reaction tubes. The partial hydrogenation of the aldehyde is exothermic (Dowtherm takes heat out and transfers it to two water coolers which operate as waste-heat recovery boilers). The butadiene reaction is endothermic; hot Dowtherm, heated in a natural-gas-fired furnace, circulates around the tubular reactors in which the ethanol-acetaldehyde vapors are passed.

Reactor effluents contain, beside butadiene, unreacted ethanol and acetaldehyde, and a large variety of minor byproducts—mainly ethylene, butenes, ethyl ether, heavier unsaturated hydrocarbons, and oxygenated compounds.

This step is followed by compression, distillation, absorption, and rectification of butadiene in order to recover this compound at the specified grade of purity, and to separate useful byproducts.

Licenses for both the partial hydrogenation of acetaldehyde and the butadiene production have been supplied by Union Carbide.

Another unit is presently being completed for the production of styrene via ethylbenzene from benzene and ethylene. Ethylene for this process is supplied from the byproduct stream of the butadiene reaction.

Synthetic rubber is manufactured by butadiene copolymerization with styrene, in aqueous emulsion, stabilized with soaps, in a double-wall reactor, at low temperature in the presence of various chemicals following standard recipes.

Ammonia is used by the cooling medium. The refrigeration unit consists mainly of six alternative compressors (manufactured by "Nuovo Pignone," the ENI subsidiary for machinery and equipment construction).

The polymer, with unreacted monomers, is freed from butadiene in a flash evaporation chamber, and from styrene by stripping with steam. The rubber process has been licensed to ANIC by Phillips Petroleum Co. The ANIC rubber is being marketed under the trade name "Europrene."

Nitrogen fertilizers produced at Ravenna will be initially under the form of nitrate and sulfate of ammonia; later other fertilizers will also be produced, to keep pace with the market demand.

The scheme of nitrogen-fertilizers production, though rather complex, is generally known, and will not be described here.

Carbon monoxide and hydrogen for ammonia production are furnished as byproduct of the acetylene synthesis. A "Texaco" partial oxidation of methane unit is also used, to supply the raw material for ammonia synthesis to substitute or to complement the production of CO and H_2 as acetylene byproducts.

Ammonia is manufactured by the Casale process, and partly converted to nitric acid by pressure oxidation (Uhde). Nitric acid is converted to nitrate of ammonia.

Ammonium sulfate is manufactured by a process (Imperial Chemical Industries-Chemical Construction Corp.) which is used here for the first time on a large scale in Italy; it uses gypsum, quarried from deposits not far from Ravenna, as raw material. The reaction consists in a double exchange between calcium sulfate and ammonium carbonate, the latter obtained by carbonation of ammonia solution.

Connected to the nitrogen fertilizers plants are large storage facilities, in which manual operations are minimized, thanks to mechanized conveyors, bag filling, and loading equipment.

The thermoelectric power station of the ANIC plant is the biggest operating in Italy to serve a chemical industry. It consists of a twin 270-ton-per-hour boilers, operating at 120 atm, with overheat temperatures of 530 C. Its capacity presently exceeds the need of the factory.

The ANIC works is connected to the Adriatic Sea (Porto Corsini) through a canal which presently can be transited by cargoes up to 5,000 dwt; the canal is being enlarged in order to allow passage of ships up to 15,000 dwt.[4]

For the long run, there ought to be no difficulties concerning marketing the output of synthetic rubber, Italian consumption of rubber during the past years having been as follows:

Italian Consumption of Rubber
(Metric Tons)

	Total	Synthetic
1954	64,000	10,000
1955	70,000	13,000
1956	70,000	15,000
1957	73,000	20,000

The percentage of synthetic rubber, although increasing, is still very low in comparison with the USA figure (63% in 1957). So this percentage will probably increase once synthetic rubber is produced in the country. Furthermore, there are potential customers in many neighboring countries.

As regards nitrogen fertilizers, a substantial part of the production will have to be exported. Italian consumption in past years (in term of nitrogen content) was:

	Tons		Tons
1953-54	210,000	1955-56	253,900
1954-55	237,900	1956-57	273,900

Consumption of nitrogen fertilizers has gone up 70% in the past five years. ENI officials feel that, inasmuch as the present consumption of fertilizers in Italy, for each hectare of cultivated land, is the lowest in Eurpoe (10 kg against 69 kg in the Netherlands, 51 in Belgium, 30 in West Germany), there is still an ample market for fertilizers, provided the prices are lowered enough to give the farmers a chance to use them on a more extensive scale.

Arrangements for the direct sale of ANIC fertilizers to the farmers through their own cooperative organization have been made recently.

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[4] A complete description of the ANIC works in Ravenna has been published in the February 1958 issue of the Italian magazine *Rivoluzione Industriale.*

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Looking down one of the main streets at the last International Petroleum Exposition, just inside the main gate.

International Petroleum Exposition growing

Warner Lewis, chairman of Warner Lewis Co., division of FRAM Corp. and a director of the International Petroleum Exposition, delivers a specially engraved invitation to officials of Simmonds Aerocessaries Ltd. in Cardiff, Wales. Mr. Lewis is in Europe on a four-month vacation, and will extend invitations to oil officials all over the continent. From left to right are Leonard Oxford, co-managing director; Stanley Goss, general manager; Mr. Lewis; and W. J. Burnell, executive director mechanical engineering.

THE WORLD of petroleum is making plans to converge in Tulsa, Okla., May 14-23, 1959, for the fourteenth anniversary International Petroleum Exposition.

W. K. Warren, chairman of the board of Warren Petroleum Corp. and exposition president, predicts that foreign attendance in 1959 will more than triple that of the 1953 show when 784 dignitaries from countries outside the U.S. registered. "Our ambassadors of invitation have been one of the busiest groups we've had," Warren said. "They have invited the chiefs of state from 51 foreign countries and individual oil men from all over the world. All indications are that we will have at least 2,200 visitors from outside the continential United States."

Members of the National Oil-Equipment Manufacturers and Delegates Society, better known as NOMADS, have set up committees for entertaining and otherwise taking care of the visitors from other countries. Don Collins of Republic Supply Co., IPE NOMADS chairman, says that his committee members have already started making plans for hosting the increased number of international delegates.

Although the oil show will be primarily for domestic exhibitors, eight foreign firms have contracted for space thus far. Three companies from England: Davy Paxman and Co., Ltd., Stewarts and Lloyds, and Petroleum Times, Ltd.; three companies from

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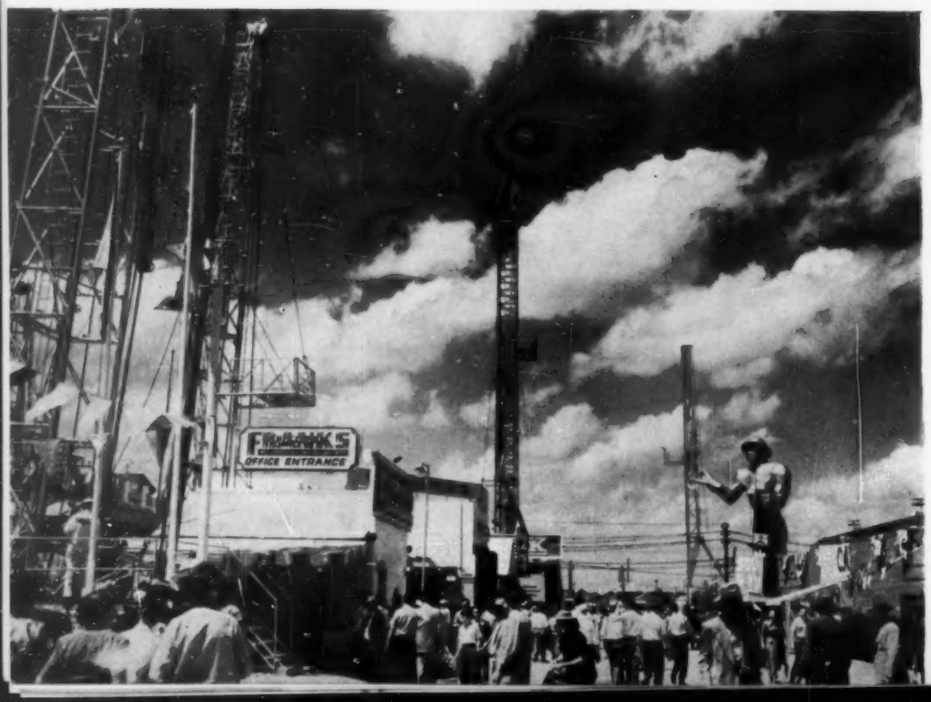
International suppliers to the oil industry set up exhibits such as these at the last show in 1953.

Members of the Tulsa chapter of NOMADS discuss plans for redecorating international headquarters on the International Petroleum Exposition grounds with W. B. Way, general manager. Standing (left to right) are R. G. Glover, Baker Oil Tools; Don Collins, Republic Supply Co.; K. O. Hoevel, National Supply Co.; Mr. Way; and H. M. Cooley, Bethlehem Supply Co. Kneeling is Gilbert Swift, Wells Surveys Inc. The Tulsa NOMAD chapter will handle all arrangements for hosting the expected 2,200 international delegates at the May 14-23, 1959, oil show. Committees from each of the other local NOMADS organizations will help.

A view of oil-field equipment exhibited at the last International Petroleum Exposition.



Germany: Klockner-Humboldt-Duetz, Eisenwerk-Wuelfel, and Mannesmann Export; International Gaslift of Tolara, Peru; and Automobiles M. Berliet of Venissieux, France, make up the foreign exhibitor list.

The fourteenth anniversary exposition will be the largest single event commemorating the centennial of the oil industry. The local chamber of commerce is also planning one of the largest parades ever seen in the southwest to help celebrate the 100 years of progress in the oil industry. The chamber committee will have several other events in connection with the centennial of oil.

Permanent buildings have had the first of several coats of paint, streets have been patched or repaired, electricians are checking the myriad of wires required to handle the tremendous loads of electricity and individual companies are starting to repair or replace their permanent sites. All in all, the grounds for the biggest exposition of its kind in the world are beginning to indicate that show time is drawing nearer. About $1 million will be spent on repairs and replacements before the grounds are ready.

The 1959 show is expected to far surpass any of the previous thirteen shows. Already, space is at a premium. Wm. B. Way, Exposition general manager, reports that 98% of all available space has been contracted. With additional acreage added this year more exhibitors have signed up now than actually exhibited in any previous show.

More than 30,000 men who buy, use and specify oil equipment in every phase of the oil industry will be on hand to look at more than one-half billion dollars worth of equipment. Exhibits will range from exploration to petrochemicals. About 2,000 individual companies will exhibit their products.

The IPE board of directors has again set up the housing bureau to take care of the thousands of visitors to Tulsa. When all of the commercial rooms are rented, citizens of the city make their homes available to provide reasonably priced, comfortable housing. Another of the institutions at the oil show is the salute to "Old Timers." More than 740 industry pioneers were registered at the 1953 show, and they will again be feted with special recognition and awards.

"Old Timers" in the fields of production, refining, pipe lining and transportation, natural gas, and supplies and equipment will be chosen for special honors. A "Pioneer of Pioneers" or Grand Old Man of the industry will be named in recognition of his outstanding contributions to the progress of the industry. Old Timer awards were originated back in 1927 by John D. Rockefeller, Sr.

One of the major highlights of this show, as in previous years, will be the Hall of Science. Scientific exhibits of all major advances in industry techniques and processes since 1953 will be shown. The science exhibit is one of the most popular spots at the exposition since most of the displays are moving models and are explained in layman's terms. END

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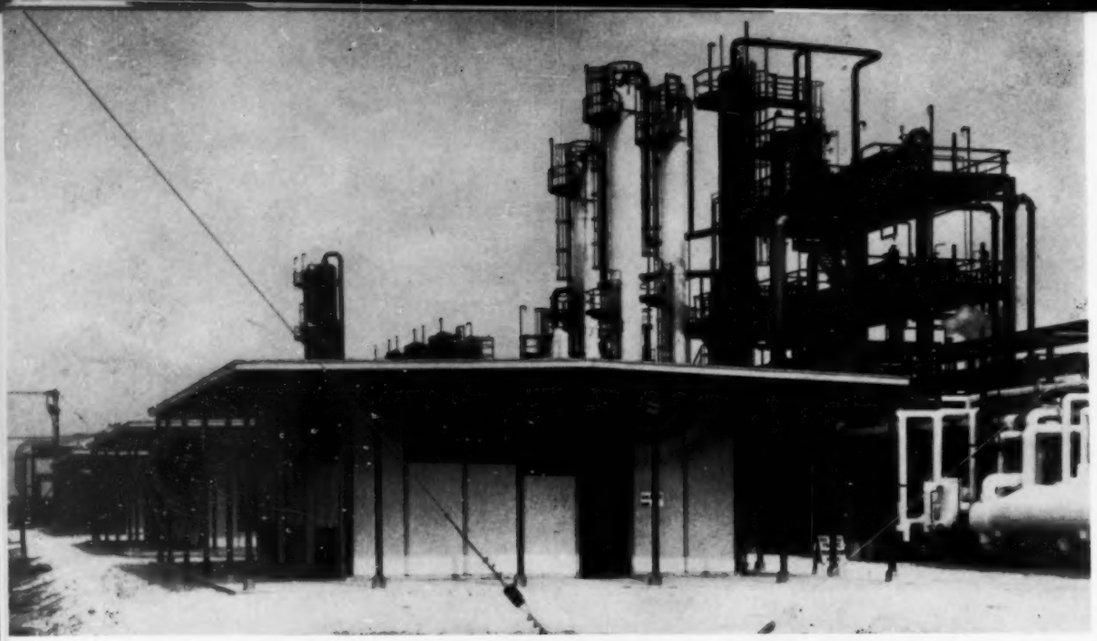

Dow's synthetic glycerin plant at Freeport, Texas (Dow Chemical photo).

Petrochemical horizons for propylene Part III: *(continued)*†

by Peter W. Sherwood*

IV (b) Glycerin via Acrolein

An entirely new synthesis of glycerin will be employed at facilities soon to be constructed at Shell Chemical Co.'s Norco, La., plant. Indications are that initial plant capacity will be 35 million pounds per year.

In this synthesis, allyl alcohol—derived from acrolein—will be reacted with hydrogen peroxide. All of these intermediates are offsprings of propylene; methods for their preparation from this hydrocarbon have been discussed in the second and third installments of this article series.

Overall, the novel method of glycerin synthesis involves a complex of five major chemical production steps: conversion of propylene to isopropanol and its partial oxidation to hydrogen peroxide, plus acetone; oxidation of propylene to acrolein, which is further reacted with isopropyl alcohol to yield allyl alcohol and acetone; and, finally, the hydroxylation of allyl alcohol by means of hydrogen peroxide. Only the last of these steps remains to be discussed in this presentation.

This hydroxylation reaction proceeds in accordance with equation (12):

$$CH_2{=}CH{-}CH_2OH + H_2O_2 \longrightarrow CH_2(OH){-}CH(OH){-}CH_2(OH) \quad \ldots\ldots (12)$$

Allyl Alcohol — Hydrogen Peroxide — Glycerin

Several techniques are available to execute this liquid-phase reaction. Best performance has been reported for operation in the presence of organic sulfonic acids as catalysts.

In this approach, hydrogen peroxide is added as aqueous solution. Allyl alcohol is fed in excess of the stoichiometric ratio, viz., in the molar range 1.1 to 4.0. Reaction temperature is 50 C to 100 C. Catalyst concentration is between 5% and 12% on the olefinic feed compound. Reaction time is two to six hours.

In one experiment, cited by C. W. Smith[14], allyl alcohol was reacted with hydrogen peroxide. The peroxide was added to the alcohol over a period of four hours followed by further reaction for an additional hour. At 90 C to 98 C, under reflux and in the presence of 5 mole % of paratoluenesulfonic acid (on allyl alcohol), the yield of glycerin, based on peroxide, was 57%.

Yield is improved by taking lower conversion per pass (by use of higher allyl alcohol to H_2O_2 ratio). Thus, reaction to 53% allyl-alcohol conversion at 40 C gave a reported yield of 75% based on hydrogen peroxide.

V—Production of Propylene Oxide and Glycol

Expansion into propylene-glycol manufacture is a logical development for ethylene-oxide producers who employ the chlorohydrin route. Both compounds can be produced in essentially the same equipment (sometimes even simultaneously) and with only minor differences of operating conditions. By contrast, the direct oxidation of ethylene—which is making most rapid strides in supplying the demand for ethylene oxide and glycol—is not today applicable to propylene-glycol synthesis. Direct oxidation of propylene, while extensively covered by the patent literature, is not now in commercial operation.

Thus, it is that the producers of propylene glycol are also producers of ethylene glycol who employ the chlorohydrination route. Carbide and Carbon, Dow, and Wyandotte have been active in this field for several years. The last-named has been producing both ethylene and propylene glycol in the same equipment, but is now constructing separate propylene-glycol facilities.

Propylene glycol has not shown a significant growth trend over the past years. Output in 1956 was 81 million pounds—

*Chemical Engineer, White Plains, N. Y.

†This concludes Part III of the article by Mr. Sherwood which appeared in *World Petroleum*, October 1958, page 60.

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about the same as it had been in 1948, and below the peak of 90.6 million pounds produced in 1952.

Everson[7] points out that propylene glycol has lost much since its peak year, and actually dropped to a minimum of 50 million pounds in 1954. The reason for this temporary decline is the loss of the antifreeze market for propylene glycol, which had been at its peak in 1951-52, when ethylene glycol was in short supply. Since then, more than adequate ethylene-glycol capacity has been provided, and with it the market for propylene glycol in antifreeze compositions has collapsed.

Partly offsetting this loss, propylene glycol has made headway in other fields, and it is noteworthy that output of this polyol increased by 10 million pounds between 1955 and 1956. Most of the new demand has come from the manufacture of polyester resins, fatty-acid esters, and hydraulic fluids. These markets supplement the consumption of USP-grade propylene glycol in the production of pharmaceuticals, flavors and cosmetics, plasticizers, and as a tobacco humectant.

Propylene oxide, intermediate in propylene glyol, is now developing markets of its own which have a promising potential. Among them are the production of polyurethanes, surfactants, and oil-demulsifying agents. Finally, interest attaches to the recently patented production of geometrically oriented propylene-oxide polymers which show promise as synthetic rubbers [equation (8)].

All propylene-glycol production is based on the chlorohydrination route, which involves three main chemical steps—with propylene oxide formed as intermediate. The following reactions are involved:

CHLOROHYDRINATION:

$$CH_3-CH=CH_2 + H_2O + Cl_2 \longrightarrow CH_3-\underset{OH}{CH}-CH_2Cl \quad \text{.....(13a)}$$

SAPONIFICATION:

$$CH_3-\underset{OH}{CH}-CH_2Cl \xrightarrow{CaO} CH_3-\underset{O}{\overset{\diagup\diagdown}{CH}}-CH_2 \quad \text{.....(13b)}$$

HYDROLYSIS:

$$CH_3-\underset{O}{\overset{\diagup\diagdown}{CH}}-CH_2 + H_2O \qquad CH_3-\underset{OH}{CH}-\underset{OH}{CH_2} \quad \text{.....(13c)}$$

This is also the reaction series which underlies the classical synthesis of ethylene glycol. The principal alternative method of ethylene-glycol production—in which the olefin is oxidized directly to its oxide—has not found commercial use in the manufacture of propylene oxide. (A third method of ethylene-glycol production employs formaldehyde as raw material. This approach is not applicable to propylene-glycol manufacture.)

In several installations, the production of propylene oxide is carried on simultaneously with that of ethylene oxide, by using mixed olefins as feed stock. Alternatively, the same facilities are used for the production of both of these epoxides, though at different times and operating conditions. More recently, the trend has been toward providing sparate facilities for the production of propylene glycol.

Though the equipment for producing ethylene and propylene oxide and glycol is quite similar, best operating conditions differ, and must be adapted to the different physical properties and reactivities of the materials involved. Facilities for propylene-oxide production are becoming available, also, as manufacturers switch their ethylene-oxide manufacture from the chlorohydrination route to the direct oxidation process. There is a strong tendency in this direction—occasioned by the high price of chlorine, the widespread availability of low-priced ethylene, and the improvements in the direct oxidation of ethylene which have been realized during the past decade.

The *chlorohydrination* of propylene [equation (13a)] is carried out in the liquid phase by contacting gaseous propylene with chlorine-bearing water. In order to obtain maximum yield, it is essential that conditions be adjusted to favor contact between propylene and hypochlorous acid (i.e., dissolved chlorine). Direct contact between propylene and elemental chlorine results in the formation of propylene dichloride and must, therefore, be minimized.

The accomplishment of this objective rests largely in the design chosen for the converter. In ethylene-chlorohydrin service, three different designs are known to be in use—all aimed toward minimizing the direct contact between ethylene and chlorine.

The most obvious method is to separate the chlorine-dissolving vessel from the reactor proper. Hypochlorous-acid solution is taken to the bottom of the converter, where it is joined by the feed olefin.

A modification of this approach combines the dissolution and reaction functions into a single unit. In this instance, the converter is a vertical column. The tower consists of four sections—of which the upper three are packed with raschig rings, while the bottom section is kept free of obstructions. Water and chlorine are fed into the bottom of the tower, while the olefin is introduced at a higher level. The two points of entry are at sufficient distance to permit completion of chlorine dissolution in water before contact is made with the olefin.

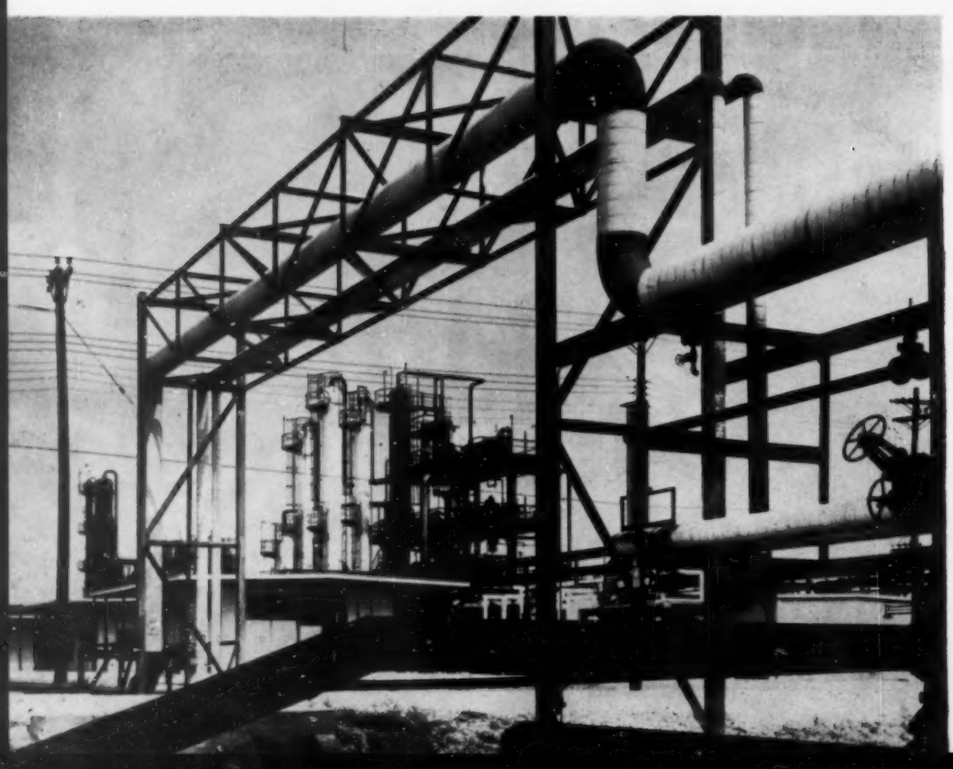
An alternative reactor design—which has attained industrial importance in both ethylene and propylene-chlorohydrin service—embodies the principle of recycling the aqueous medium. Typically, a recycle reactor consists of a main column and a side leg which are joined into a single loop. Both legs of the loop are filled with reaction liquor. Space is provided atop the main column to separate tail gas from the liquid reaction medium.

In this system, propylene is introduced into the bottom of the main column. As it rises through the liquor, it is partly reacted. The remaining gas phase provides a gas-lift—carrying liquid with it to the disengagement space at the column's top.

A portion of the reactor liquid is withdrawn from the phase separator, but the bulk is recirculated to the tower bottom via the side leg in which it is joined by chlorine.

The important effect of such a recirculation system is that a high local chlorine concentration can never occur. As a result, yield tends to be higher than is obtainable in single-pass reactors. Relative performance in these two types of reactor has been investigated in the laboratory by Ferrero

Dow's synthetic glycerin plant at the Texas Division, which went onstream in summer of 1955 (photo courtesy Dow Chemical Co.).



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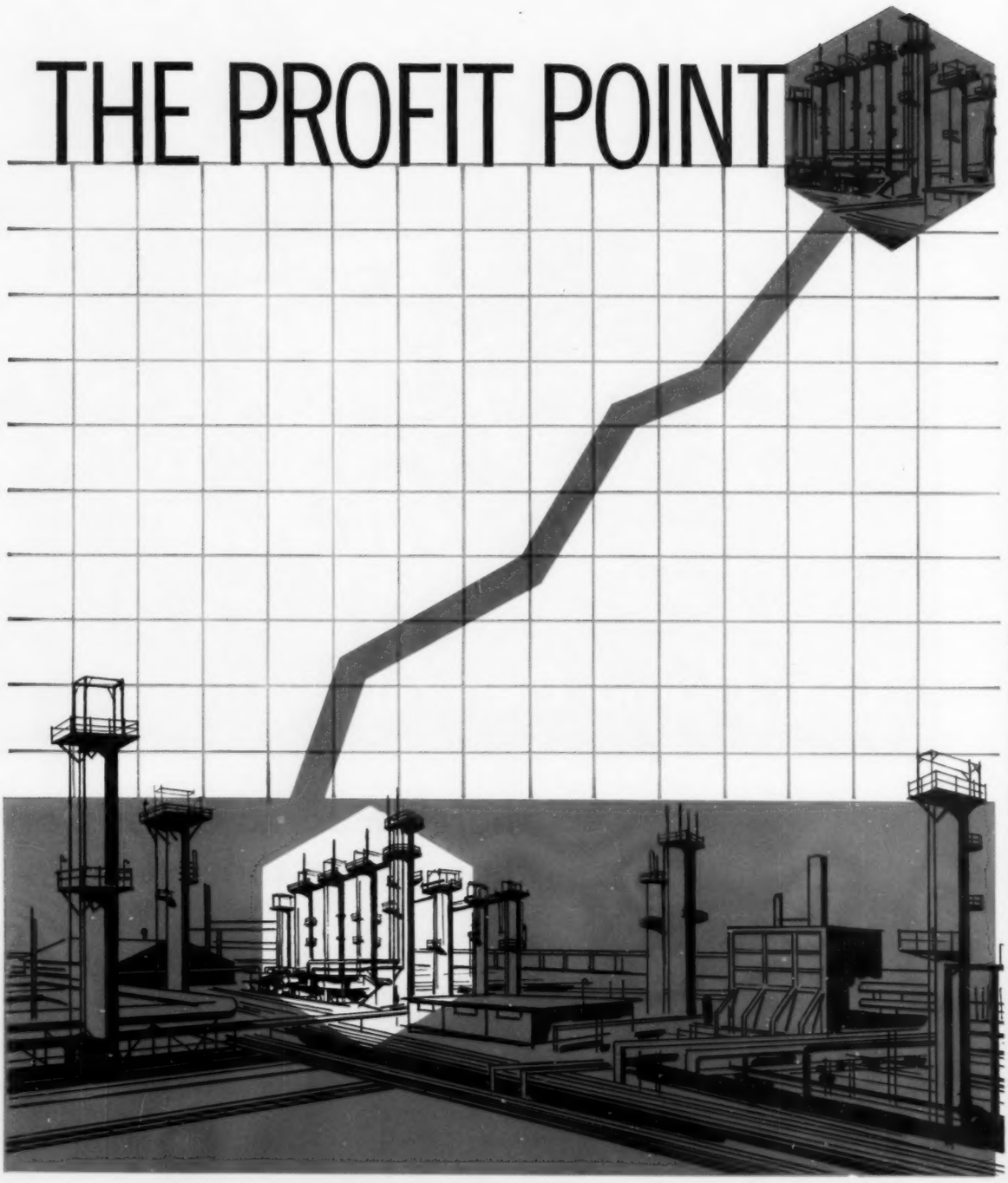

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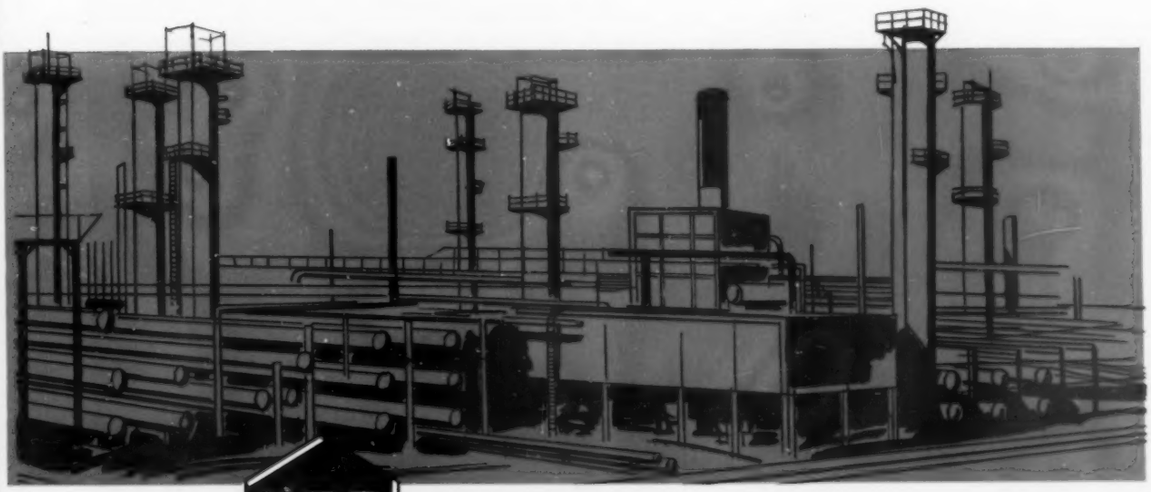

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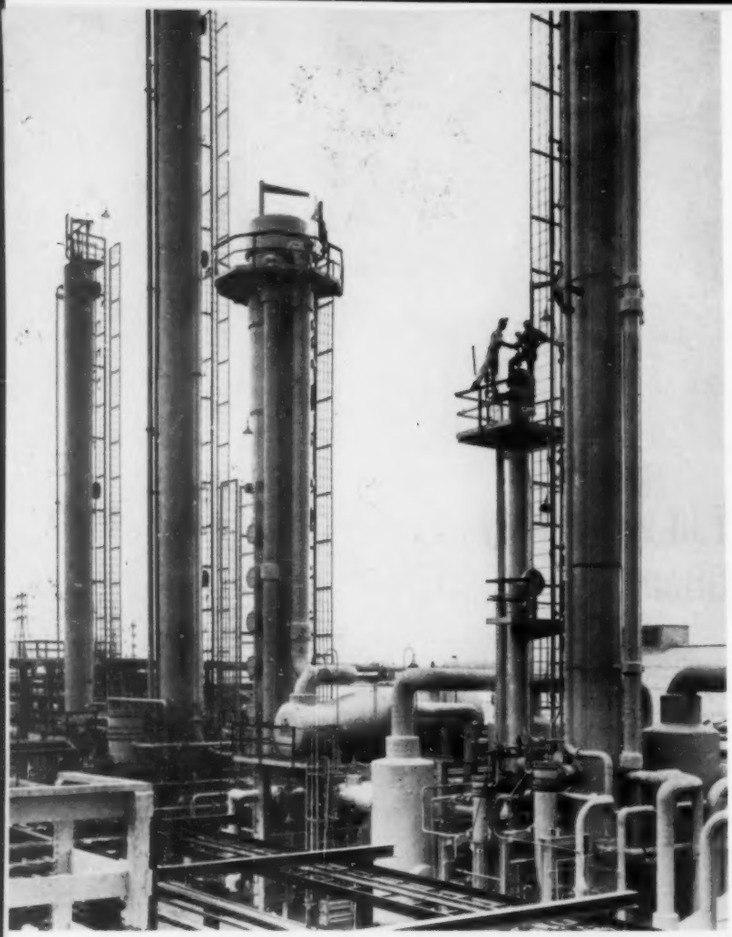

Distillation equipment in Shell Chemical Co.'s synthetic glycerin plant, Deer Park (Shell Chemical photo).

et al.[5]. In this investigation, chlorohydrination in a recycle reactor yielded 87.5% propylene chlorohydrin, 11.0% propylene dichloride, and 1.5% dichloroisopropyl ether. At otherwise comparable conditions in a single-dress converter, propylene-chlorohydrin yield was only 69.2%. Formation of propylene dichloride and dichloroisopropyl ether was 21.6% and 9.2%, respectively, on converted propylene. A somewhat smaller yield advantage (about 5%) has been reported for the commercial use of recycle reactors in the chlorohydrination of ethylene.

The extent of side reactions is influenced by operating temperature, which should be held below 50 C to 60 C. Even so, formation of some propylene dichloride is unavoidable. If this compound is permitted to build up in the reaction space, it will form an organic phase which will favor production of more propylene dichloride.

This occurrence of a second phase can be essentially avoided by using a dilute-feed propylene stream, containing less than 45%. The inert gas will then be sufficient to strip propylene dichloride from the system as it is formed.

The attainable yield is influenced by the concentration of dissolved chlorine at the point of contact with feed chlorine. According to Ferrero[5], this value should be less than 0.5 gram per liter.

Of further importance is the concentration of propylene chlorohydrin at the reactor exit. At 45 C, and with a chlorine content of 0.15 gram per liter at the mix point with propylene, Ferrero obtained propylene chlorohydrin in 97% yield by maintaining the concentration of this compound below 5 grams per liter. When this concentration was raised to 50 grams per liter, reaction efficiency dropped to 89.5%.

Saponification and Hydrolysis: The techniques in saponifying propylene chlorohydrin to propylene oxide, and in hydrolizing this intermediate to propylene glycol, are very similar to the methods employed in the conversion of the corresponding ethylene compounds.

In the saponification stage, a major point of difference between the two homologues is the much slower conversion of propylene chlorohydrin—which proceeds at only approximately one-tenth the rate which is observed in the saponification of ethylene chlorohydrin. Therefore, in synthesizing propylene oxide, it is essential to remove product from the reaction system just as quickly as it is formed in order to permit the greatest possible driving force toward equilibrium.

The conversion of propylene chlorohydrin to propylene oxide is carried out in liquid phase. The organic feed material is in aqueous solution, as it is received from the chlorohydrination tower. The saponifying agent is lime.

In industrial operation, lime is supplied as an aqueous slurry containing about 10% CaO. This stream serves to neutralize HC1 contained in the chlorohydrin solution, as well as to react with HC1 evolved in the course of the saponification reaction. A slight excess of lime is used.

Specifications for saponification-grade lime call for less than 1% magnesia, since this impurity tends to favor the formation of propionaldehyde. Nitrogen compounds promote polymerization and must, therefore, also be essentially absent (maximum ammonia assay =0.05%).

pH in the saponifiers is controlled between 8 and 9, the optimum value for maximum rate of propylene-oxide formation. Operating temperature is at the boiling point of the solution at essentially atmospheric pressure.

The saponification reaction is highly exothermic, and causes considerable vaporization of the solution. Essentially all the propylene oxide (boiling point, 35C) passes into the vapor phase. The gaseous reactor effluent is passed to a partial condenser through which propylene oxide and propylene dichloride are allowed to pass in the vapor phase while most of the contained steam is condensed and refluxed to the reactor.

The vapor leaving the overhead dephlegmator is liquefied in a total condenser. Contained propylene oxide is purified in a train of distillation columns which are operated at vacuum.

A purge stream of reaction liquor must be withdrawn from the saponifier continuously. This stream contains less than 1% CaO plus a like amount of organic impurities, principally glycols.

Hydrolysis of propylene oxide to its glycol [equation (13c)] may be effected noncatalytically at high temperature and pressure (approximately 195 C and 200 psig), or at more moderate conditions (50 C to 70 C) in the presence of a small amount (0.5% to 1.0% by weight) of sulfuric acid. In either case, the oxide is mixed with 6 to 10 times its weight of water.

The drawback of high-pressure operation is the need for coded reaction equipment. On the other hand, sulfuric-acid catalysis creates problems of corrosion and of product purification.

In either event, the neutralized and catalyst-free reactor effluent is concentrated by multiple-effect evaporation followed by vacuum distillation. In addition to the main product (propylene glycol), marketable dipropylene and tripropylene glycol are recovered. END

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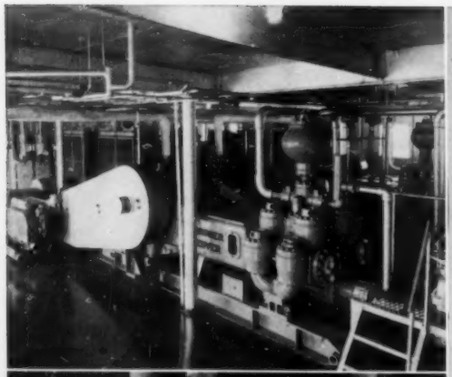

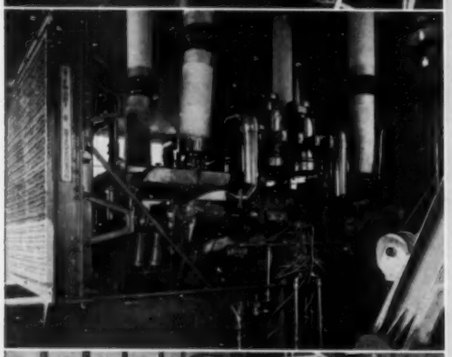

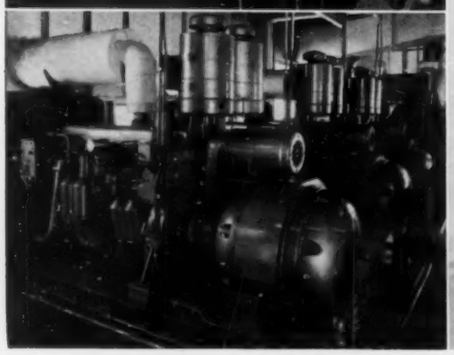

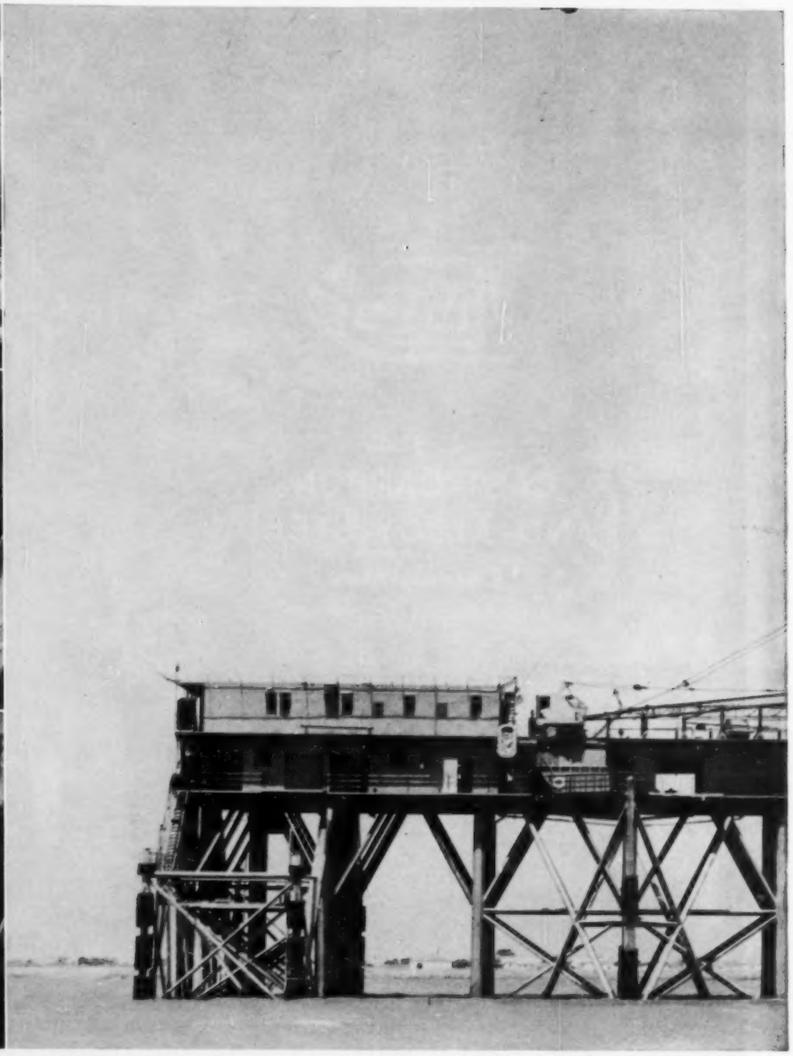

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1

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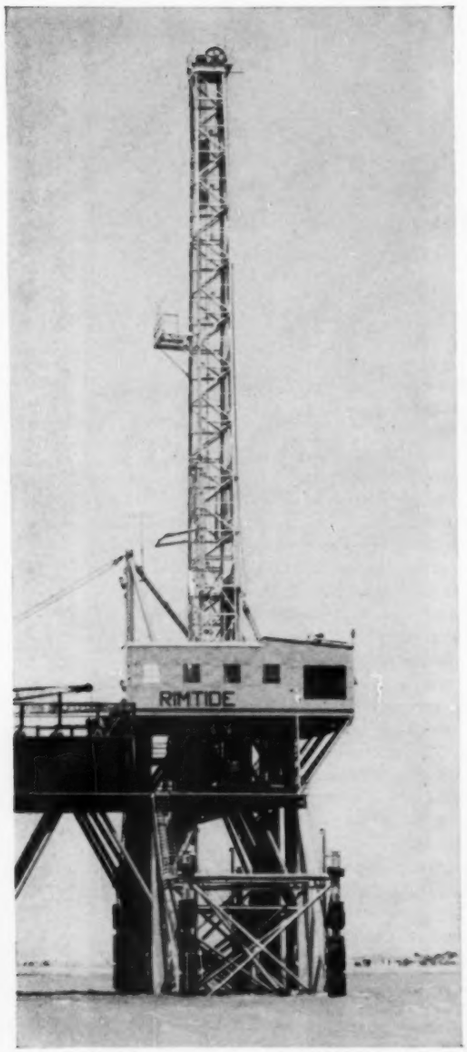
2

Rimrock Tidelands Rig #15 Powered by two Stewart & Stevenson Model S-24-2406 Quad 110 Power Units, developing 2000 combined HP. Auxiliaries consist of two S & S Model 110 GD-110, 100 KW AC Generator Sets.



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3

Rimrock Tidelands Rig #14 Powered by two Stewart & Stevenson S-24-2406 Quad 110 Power Units, developing 2000 combined HP. Auxiliaries consist of two S & S Model 110 GD-110, 100 KW AC Generator Sets.

4

The RIMTIDE is the newest member of the Rimrock Tidelands family of offshore drilling rigs. Powered by three Model S-24-2406 S & S model 6-110 Quads and one Model 12-2406 GM Twin 110 Diesel Engines, developing 3500 combined HP. Auxiliaries of three S & S model 110 GD-100, explosion resistant, 100 KW AC Generator Sets and one Model 6-110 GM Power Unit.

Review of recent USA patents on catalysts for the petroleum industry

by Heinz Heinemann and Harold Shalit

A LARGE number of patents on catalysts is issued each year. In the past, catalyst preparation methods have been reviewed periodically, together with the refining processes, in which the catalysts find application. A separate review is now proposed, to show up-trends and relationships in the preparation of quite different catalytic materials.

It is apparent from the about 40 representative patents discussed here (which have not previously been treated), that the major effort in catalyst research is directed toward controlling purity of catalysts and toward enhancing activity by special treatment or promoters. While much of this work is based on newer theories of catalysis, the patent literature is, of course, predominantly concerned with the art of catalyst manufacture rather than with causes for the effectiveness of certain methods.

In line with the predominance of catalytic processes in the refining industry, the number of catalyst patents is increasing steadily. Even such relatively old subjects as catalytic cracking catalysts still receive major attention.

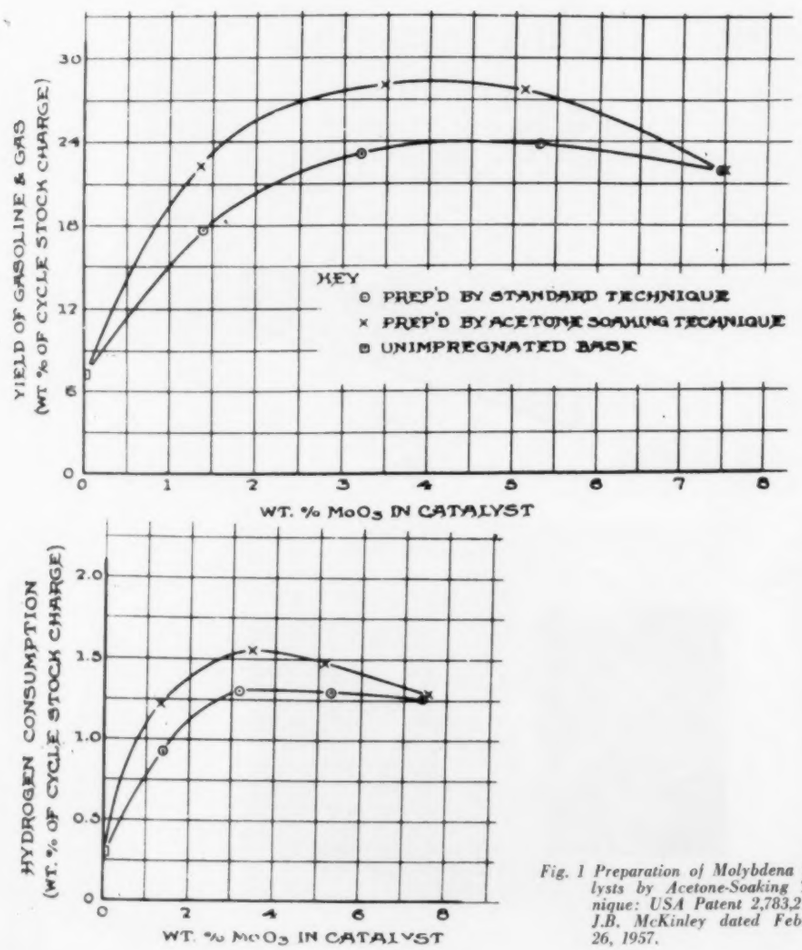

YIELD OF GASOLINE & GAS
(WT % OF CYCLE STOCK CHARGE)
KEY
PREP'D BY STANDARD TECHNIQUE
PREP'D BY ACETONE SOAKING TECHNIQUE
UNIMPREGNATED BASE
WT. % MoO3 IN CATALYST
HYDROGEN CONSUMPTION
(WT. % OF CYCLE STOCK CHARGE)
WT. % MoO3 IN CATALYST

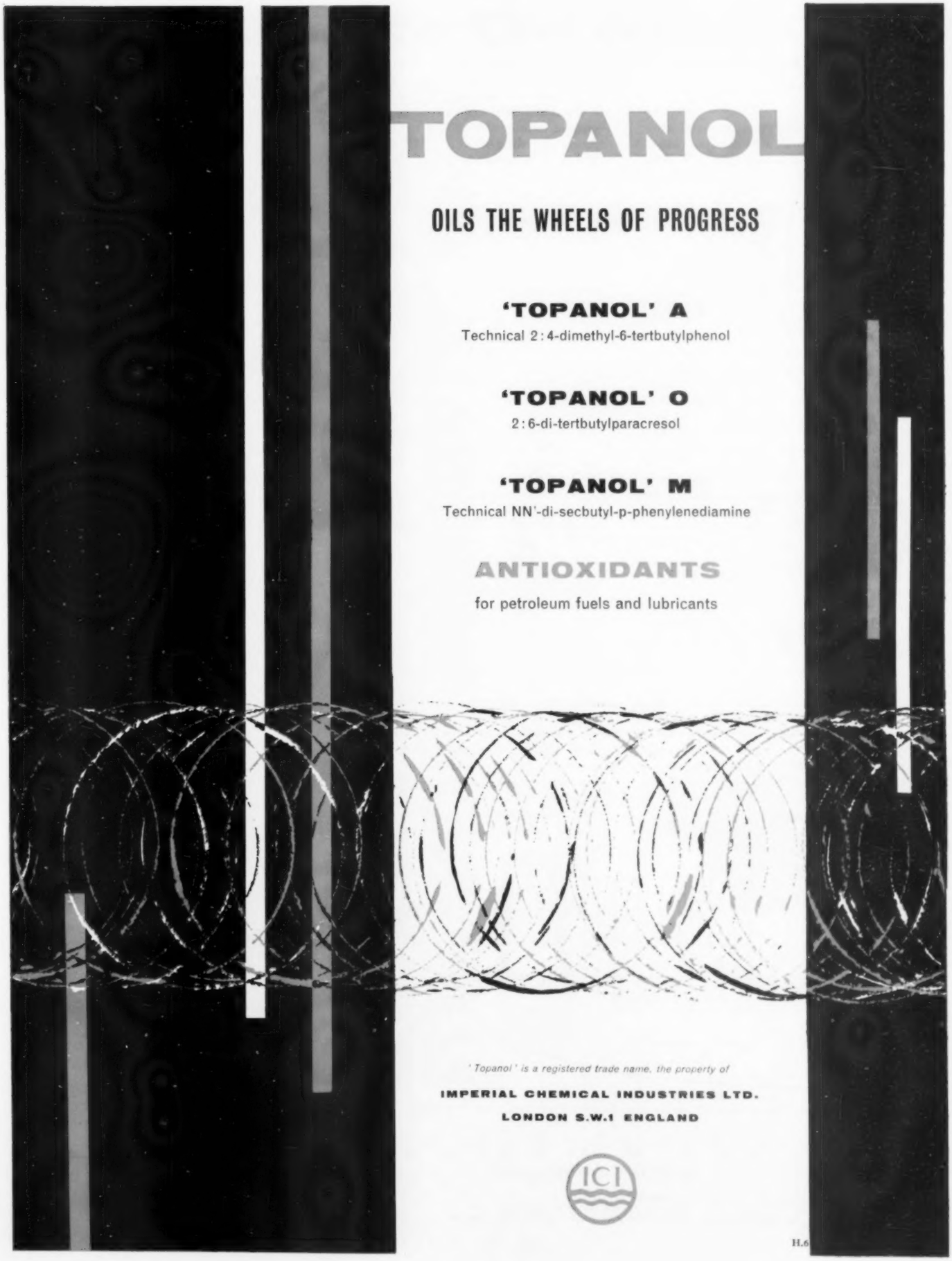
Fig. 1 Preparation of Molybdena Catalysts by Acetone-Soaking Technique: USA Patent 2,783,211 to J.B. McKinley dated February 26, 1957.

Alumina Catalysts and Supports: A group of Universal Oil Products Co. patents deals with the production of alumina from aluminum metal. H. S. Bloch in 2,758,011 reacts aluminum and water at 482-700°F. at sufficient pressure to maintain a liquid water phase. Alumina, as boehmite and hydrogen are produced. In 2,835,638 Bloch and G. L. Hervert carry out the reaction of aluminum and water in the presence of a catalytic amount of mercury promoter and an acidic compound, such as inorganic acids, polyvalent organic acids and acid acting salts. The monovalent acid ion should be present in an amount below 0.13 equivalents of acid anion per equivalent of metal. According to 2,820,693 and 2,820,694 Hervert and Bloch prepare alumina from aluminum containing less than 100 p.p.m. of tin, lead or germanium by reaction with an aqueous acid solution. After about 25% of stoichiometric hydrogen has been evolved, aluminum containing 100-10,000 p.p.m. of the same metals or iron is added. In M. W. Kellogg Co. patent 2,840,529 P. A. Lefrancois reacts aluminum and water in the presence of 0.005-0.1 lb./lb. Al of a compound of mercury, zinc or cadmium. The reaction is at least 150°F. and produces alumina in a slurry, having a pH between about 7.5 and 9.5.

The reaction between aluminum metal and anhydrous aniline is described in Esso Research and Engineering Co. 2,822,337 (E. B. Evans). It is carried out at the boiling point of aniline in the presence of a small amount of a mercury compound. The reaction product is hydrolyzed to liberate aniline and form hydrous alumina gel.

Three Houdry Process Corp. patents deal with activated alumina. T. H. Milliken and D. W Koester (2,769,688) calcine gamma alumina, containing about 0.3-0.6% sodium at 700-1100°F. and then leach with a mildly acidic solution to extract substantially all of the combined sodium. The acidic reagent may be formic, acetic, lactic, boric or oxalic acid. S. E. Voltz and S. W. Weller (2,810,698 and 2,810,699) inhibit the transformation of gamma to alpha alumina even at fairly severe conditions by incorporating thoria or hafnium dioxide in the alumina in an

(Continued on page 92)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Review of Recent USA Patents

(Continued from page 90)

amount of 0.5-1.5 cation % of metal ions.

A large pore, high area alumina (350-550 m^2/g) is prepared according to J. W. Teter, J. L. Gring and C. D. Keith (2,838,375 to Engelhard Industries). Hydrous alumina, containing 65-95% trihydrate, is dried and calcined by special procedures.

Silica Gel: V. Haensel and J. W. Ziglar (2,794,002 to Universal Oil Products Co.) discolse a method of preparing silica hydrogel by commingling with an aqueous ethyl orthosilicate solution from 0.001-0.1 mols of HF per mol of silicate. The result-SO_4 is gelled.

Cracking Catalysts: A skeletal silica-alumina glass catalyst, substantially free from alkali metal is disclosed in Imperial Chemical Industries, Ltd. patent 2,835,637 (D. A. Dowden, L. V. Johnson and G. C. Vincent). A mixture of 10-35% alumina, 30-60% silica, 5-20% magnesia and 10-22% boria is fused to produce a glass. The glass is heated to 650-950°C to cause phase separation. At least one phase is extracted with a boiling, aqueous solution of strong mineral acid, resulting in the skeletal catalyst. Silica-alumina beads of reduced density and increased porosity are the subject of Sinclair Refining Co.'s 2,827,421 (H. Erickson). A $Si0_2$-$A1_20_3$ hydrogel is treated with dilute aqueous ammonium fluoride and calcined without washing. R. W. Richardson and R. E. Schexnailder (2,746,934 to Esso Res. & Eng. Co.) form silica-alumina microspheres by dropping droplets of silica hydrosol through a liquid body of anhydrous aluminum alcoholate in a solution containing excess alcohol. Alcoholate is hydrolyzed by contact with water in the silica hydrosol. The water is taken up by the excess alcohol. This hastens gelation of the silica hydrosol droplet on which alumina is deposited. These droplets are removed, dried and calcined.

In an extension of their previously described method to produce alumina, G. L. Hervert and H. S. Bloch (2,804,433 to Universal Oil Products Co.) propose to react aluminum metal with water in the presence of sodium metasilicate for the preparation of a silica-alumina. C. N. Kimberlin and E. M. Gladrow (2,798,857 to Esso Res. & Eng. Co.) prepare a substantially pure, acidic silica hydrosol by the cation exchange method. An ammonia containing liquid is added to give a silica hydrosol, having a pH of at least 8. This is mixed with an aluminum alcoholate solution to form a silica-alumina, having a pH on the alkaline side. Glacial acetic acid is added to gel the mixture.

Reactivation of deactivated siliceous hydrocarbon conversion catalyst is the subject of Socony-Mobil Oil Co.'s 2,814,598 (E. W. Swegler; see accompanying graph). The catalyst is soaked for at least one hour in a solution of an ionizable alkaline alkali metal compound, having a pH of at least 10. The catalyst is then water washed and alkali metal is base exchanged off the catalyst. After steam treatment at 1000-1300°F. the catalyst is ready for reuse.

Reactivation of nickel poisoned cracking catalysts can be accomplished, according to H. G. Doherty and C. J. Plank (2,758,097 to Socony-Mobil Oil Co.). The poisoned catalyst is impregnated with a small amount of phosphorus pentoxide, and is then steamed at 800-1500°F. for at least two hours.

Three Houdry Process Corp. patents deal with clay catalysts. Kaolin cracking catalyst can be prepared according to T. H. Milliken and W. L. Weidman (2,840,530) by mixing finely divided kaolin clay with 5-12 wt. % wood flour. The mixture is formed into particles and heated in an oxidizing atmosphere to about 1500° F. to burn out the wood flour. Porous, active, stable catalyst particles are recovered. H. A. Shabaker (2,754,273; see illustration) sulfides iron containing clays and leaches with mineral acid in successive batchwise operation, in which the clay is subjected in stages to successive treatment with acid of increasing purity. The used acid from treatment of a preceding batch is employed in leaching the next succeeding batch. The temperature is controlled to 50-90°F. during initial contact of the clay with acid. Substantial attack on the aluminaceous component of the clay is thus prevented. In 2,825,699 J. E. McEvoy, and T. H. Milliken treat iron containing clays first with hydrogen sulfide above 1200°F., then with air. The clay is then heated with ammonium chloride to 300-800° and iron compounds are converted to ferric chloride below conditions, at which ammonia compounds are decomposed. Ferric chloride is removed by purging with inert gas at 1000°F.

Reforming, Dehydrogenation, and Hydrodesulfurization Catalysts: This is an extremely active field. Aspects of it were discussed in the 1958 Annual Refinery Issue of World Petroleum. Additional patents are treated here.

Platinum type reforming catalysts form one group of patents. J. W. Teter, J. L. Gring and C. D. Keith (2,838,444 and 2,838,445 to Engelhard Industries) incorporate 0.1-1% platinum into the alumina base of their earlier discussed patent 2,838,375. The platinum is distributed in sufficiently finely divided form to exhibit by X-ray diffraction studies the substantial absence of crystallites larger than about 50Å. V. Haensel (2,840,532 to Universal Oil Products Co.) impregnates alumina with a water soluble platinum compound and an acidic compound selected from nitric, sulfuric and phosphoric acids, aluminum nitrate, oxidic acid, formic acid and propionic acid in an amount to impart to the solution of pH of below 2.5. H. M. Brennan, H. S. Seelig and

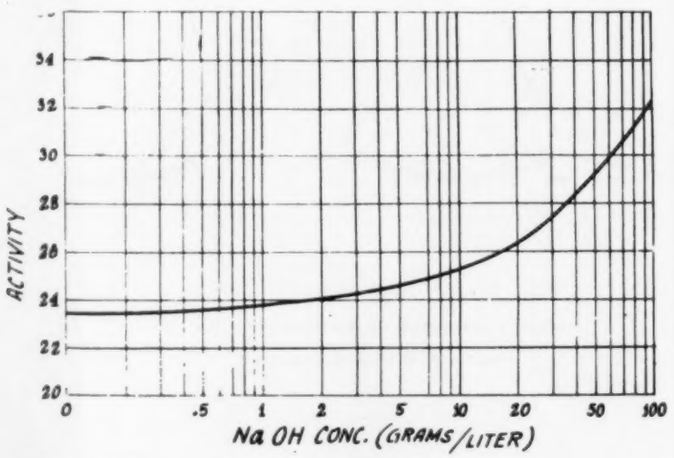
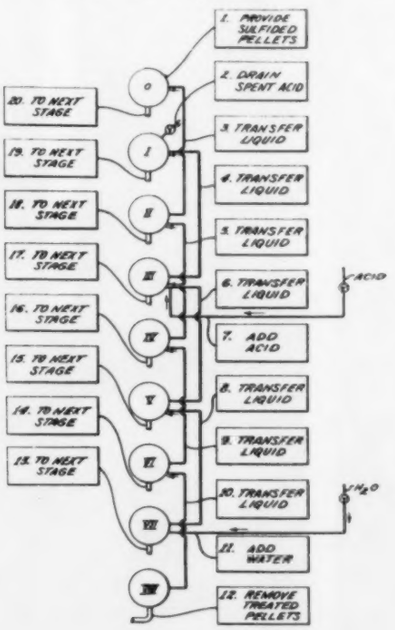


Fig. 2 Reactivation of Cracking Catalysts by Soaking in Alkali Solution: USA Patent 2,814,598 to E.W. Swegler dated November 26, 1957.

Fig. 3 Method of Leaching Iron Sulfide from Clays and Minerals: USA Patent 2,754,273 to H.A. Shabaker dated July 10, 1956.



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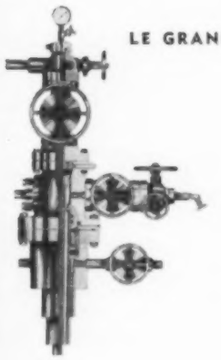

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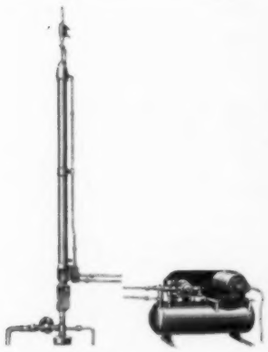

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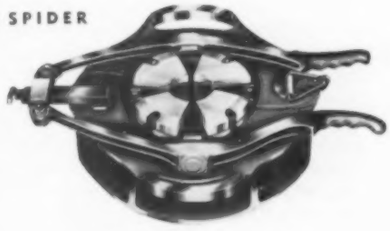

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R. W. V. Haar in Standard Oil Co. of Indiana's 2,840,527 claim an appreciable enhancement of catalytic activity of platinum-alumina composites by incorporation of an inorganic aluminum salt. The effect can be obtained for instance by between 0.001 and 0.02 mole aluminum chloride per mole of alumina. G. A. Mills and T. H. Milliken (2,840,528 to Houdry Process Corp.) prepare a very active platinum-alumina or platinum-silica-allumina catalyst by impregnating the base with chloroplantimic acid, drying to a water content below 1 mg/m^2 of surface and sulfiding at least a portion of the chloroplatinate in the absence of steam. The catalyst is then reduced with hydrogen at 500-1000° F.

Molybdena and cobalt-molybdena catalysts are discussed in a large number of patents of which the following are typical. J. B. McKinley (2,783,211 to Gulf Res. & Dev. Co.; see illustration) contacts a silica-alumina carrier with an aqueous solution of ammonium and molybdate. The wet, impregnated carrier is soaked with a volume of acetone less than ten times the volume of adsorbed impregnating solution. This precipitates ammonium molybdate on the carrier which is then dried and calcined. The preparation of cobalt-molybdena-alumina catalysts is the concern of two Universal Oil Products Co. patents. D. L. Holden (2,813,-837) calcines the support at 600-1600°F., hydrates the calcined particles to about 1-10 wt.% water and impregnates them with an acidic solution of molybdic acid, cobalt nitrate and—if desired—hydrogen fluoride. J. F. Riedl (2,753,301) forms a mixture of molybdic and oxalic acids. He commingles cobalt nitrate with the mixture and composites it with alumina particles. The product is heated, calcined and sulfided. Halogen may be composited with the alumina. P. K. Nozaki in Shell Dev. Co.'s 2,813,835 describes the reactivation of sulfided catalysts of combinations of nickel, molybdenum and tungsten on a support. These catalysts, when deactivated, are regenerated by controlled oxidation at 400-650°C. The catalyst is cooled to below 250° in a non-reducing atmosphere and is treated at 100-250° with a mixture of hydrogen and hydrogen sulfide, before raising the temperature back to operating temperature.

Chromia catalysts also receive considerable research attention. R. M. Dobres (2,807,593 to Socony-Mobil Oil Co.) proposes preparation of a hydrogel comprising a major proportion of chromia and a minor proportion of one or more metal oxides. An aqueous solution of chromic acid is added to an alcoholic solution or suspension of one or more metal alcoholates. The resulting hydrosol sets to a true hydrogel. Microspheres of chromia-alumina hydrogel are produced according to Standard Oil Co. of Ohio's 2,819,229 (H. A. Strecker and J. L. Calahan). Small amounts of acetic acid are incorporated into a slurry of the hydrogel, which has a solids content of 8-15%. This addition decreases the viscosity of the slurry sufficiently to make it pumpable and permit its spray-drying. In another Standard Oil Co. of Ohio patent (2,819,230) Strecker lowers the attrition rate of chromia-alumina catalyst by: (1) heating microspheres in an inert atmosphere to 1000-1600°F., (2) cooling the microspheres to about 500° before quenching, and (3) quenching by immersing the spheres in water.

C. J. Plank (2,746,936 to Socony-Mobil Oil Co.) has devised a method by which only the outer shell of an alumina support is impregnated with chromia, leaving a core of alumina. This is accomplished by partially filling the pores of the support with an inert, vaporizable liquid, which is chemically unreactive with alumina, such as water. The support is then contacted with impregnating solution for a period during which no appreciable diffusion occurs. The product is dried.

Olefin Oxidation Catalysts: Olefin oxidation catalysts continue to be improved and each year there are a number of new patents in this area. B. M. Burford and A. Cambrow (2,837,424 to The National Research Council of Canada) prepare an ethylene oxidation catalyst by producing an alloy, comprising silver, 1.75% calcium, 0.1-0.4% nickel and as much magnesium as nickel. The alloy is treated with acid to remove from 5% to all but a trace of calcium and magnesium, without significant removal of silver. This same catalyst is made suitable for fluidized bed operation in accordance with G. L. Osberg's 2,837,486 (to National Res. Council). The particles are coated with 0.2-5% of calcium oxide, calcium carbonate, calcium phosphate, barium oxide, strontium oxide, or strontium carbonate to render them non-agglomerating. F. J. Metzger in 2,805,207 produces a silver catalyst without the use of a reducing agent. A strong ammoniacal silver nitrate solution is applied to an inert metal oxide carrier, so that 1.6-5.5% silver are absorbed. The resulting product is dried and heated to 250-350°C. to give silver in catalytically active form.

Miscellaneous Catalysts: The selective hydrogenation of acetylenes in olefins is of importance for the purification of ethylene and propylene streams prior to polymerization. H. W. Fleming and R. E. Reitmeier (2,840,531 to National Cylinder Gas Co.) describe a nickel-chromium catalyst for this purpose. From 2 to 15% of the calcined metal oxides are supported on high grade alumina or on carrier mixtures comprising at least 20% hydraulic cement and at least 10% clay.

A solid phosphoric acid catalyst is disclosed in Universal Oil Products Co.'s 2,833,727 and 2,833,728 (J. M. Marity and M. S. Bielawski). From 15 to 75% phosphoric acid is mixed with 85-25% of a siliceous adsorbent. The resulting mixture is subjected to compression at 5000-50,000 psi and is thereafter extruded, dried and calcined.

Regeneration of a spent, sulfactive Oxo aldehyde hydrogenation catalyst, such as molybdenum sulfide is claimed in Esso Res. & Eng. Co.'s 2,833,725 (J. J. Owen, R. B. Mason and R. N. Watts). The catalyst is contacted with a liquid, polar organic solvent, which dissolves the organic materials deposited thereon, and with carbon monoxide comprising gas at 1500-4500 psig. and 100-450°F. The catalyst is then resulfided.

END

Operation "Whiffy"

(*Continued from page 45*)

put up $50,000 each per year over a five-year period, to underwrite a fundamental research program. Remembering the failure of the earlier attempt, they stipulated that the money could be used solely for fundamental projects as distinguished from applied research.

From those little acorns grew the big program now under way.

Dr. Spaght, in a report to the API Board of Directors, said 235 of the best scientific people in the petroleum industry are participating in the program, and they represent 41 different companies. He noted, too, that the costs are underwritten by 84 different companies, with no one company contributing more than 9% of the total budget.

The accumulated knowledge resulting from API's fundamental research program is stupendous, although none of it came in anything resembling spectacular fashion. It represents the steady dreaming, plugging, testing, and retesting of the research scientists. There were times, however, when sideline benefits came unexpectedly. For example, one of the projects, years ago, developed an understanding of a subterranean phenomenon now known as retrograde condensation. This knowledge enabled the industry to develop processes to recover an additional two bililon barrels of crude oil which might otherwise have been lost forever!

Again, to quote Dr. Spaght, here are some of the results:

"We use hydrocarbon antiknock data disseminated by API research for judging the potentialities of untried processes for improving gasoline octane. We use data from API research, or methods which have been drawn on those data, in analyzing petroleum fractions for hydrocarbon and sulfur and nitrogen constituents. We calibrate our physical instruments with pure reference materials from API research. If we must prepare reference materials in our laboratories, we consult first the methods for synthesis and purification which have been perfected by API research. And, if we wish to subject our technical speculations to the discipline of thermodynamics before promoting them to the status of plans, we look to API research for the data. Most important, throughout all this, when we turn to API research, we do so with confidence, founded in experience, that the data are good data, obtained by the best methods available at the time.

"It is no overstatement to say that alkylation, isomerization, and dehydrocyclization would not have come into our vocabulary as refinery processes if we had not had available the basic data on hydrocarbons to allow us to design the necessary process equipment. Today, the design of a fractionating column for separating *iso*butane and *n*butane is quite routine, but it became routine only though our knowing exactly the properties of *iso*butane and *n*butane. The data supplied to industry through API research have aided immeasurably in bring-

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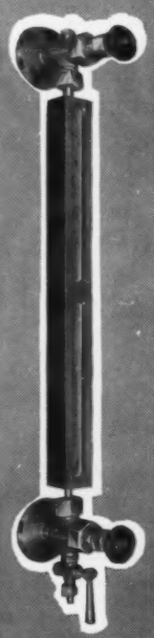

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ing about such milestones of progress in our industry."

Citing a specific example of its accomplishments, Dr. H. W. Feld, vice president of The Atlantic Refining Co., Philadelphia, Pa., said:

"During the early days of World War II, the highly purified hydrocarbons isolated from petroleum by Project 6 became very valuable as standards for calibrating infrared, raman, ultraviolet, and mass spectrometers for hydrocarbon analysis. These analyses, in turn, provided the control methods which were needed so badly in operating the high-octane gasoline plants which eventually were to win the war."

Dr. Howard G. Vesper, president of Standard Oil Co. of California-Western Operations Inc., hailed the API program as "one that takes a back seat to none . . . the largest and most productive of any industry in the land."

Originally, budgets for the various projects were extremely modest. Today, they still are limited and tightly controlled, but they reflect greater activity and the spiraling costs of contemporary times. Funds are raised on a voluntary basis. The only pressure—if it even can be called that—is in the form of a reminder sent to past contributors once the budget is approved.

In the 30 years it has been in existence, fundamental research has represented an investment of more than $7 million. The current budget is approximately $900,000. This not only underwrites various projects, but also provides small sums to be assigned as special grants to outside projects which might be of fundamental value to the industry.

Raising the money has never been a problem, for there isn't a scientist in the industry who doesn't agree that the fundamental research program is one of oil's biggest bargains—one which transcends all thoughts of money.

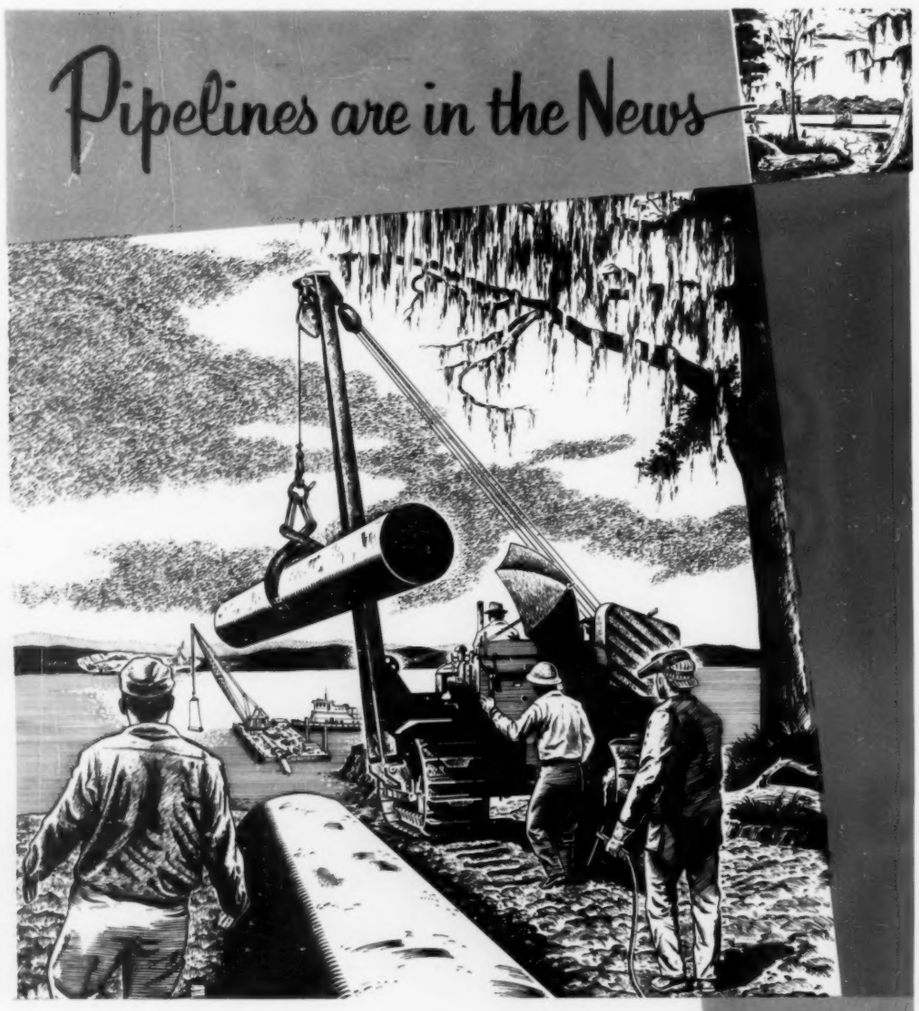
Confirming this, in more ways than one, is the comment of Dr. Field:

"We, at Atlantic, believe the use we have made of the API pure hydrocarbon standards alone has been worth more to us than our whole contribution to the API fundamental research program."

Dr. Spaght said the research job itself is a tremendous assignment, explaining: "Isolating a single hydrocarbon in the organic maze of petroleum, for example, is like hunting for a lost child in the 4th of July crowd at Coney Island, when you do not know the child's sex, age, size, or color!"

But, with quiet confidence, he added:

"The API program is quiet and unspectacular, as the dictionary or the seed business must always be. It does not make headlines. But it does move forward, building a massive foundation on which individual, competitive companies can erect structures as spectacular and as profitable as their imaginations and abilities allow. There is no doubt in my mind that the API fundamental research program is the industry's biggest bargain in brains." END



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GAS
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ENGINEERS-CONSTRUCTORS
NBT BUILDING TULSA, OKLAHOMA
CABLE ADDRESS: WILLBROS

Engineers of Dowell have developed a small two-way radio for use in oil fields where the noise level is unusually high, as for example on well-servicing jobs where many high-powered engines are operating at full throttle.

The radio, not much larger than a package of cigarettes, is nested in a specially designed safety hat. Earphones and transmitter are incorporated into the assembly so that the wearer's hands are left free. The entire unit weighs about 2½ lb, and operates on a small 9-volt battery about the size of a flashlight battery. The range of effective use of the set is about 2,000 ft.

New Dowell Research Post

Dowell has created a new department in its research and development organization to be devoted to chemical research. A. F. Beale, Jr., will be director. Mr. Beale came to Dowell in 1953 from the Michigan Memorial Phoenix Project at Ann Arbor.

By bus to the moon and back—8000 times

When the giant buses roll – millions of Americans ride. Students to and from school. Workers to and from their jobs. Salesmen, shoppers, families . . . eager vacationers and tourists.

Last year the buses in America carried more than seven billion passengers. These buses travelled more than four billion miles. In today's space talk, that is equal to more than eight thousand trips to the moon and back!

This tremendous free movement of people has been facilitated by fuels and lubricants produced by the petroleum industry, backed up by extensive research and service. Texaco is a leader in this vast network of transportation – actually *more buses in the United States are lubricated with Texaco products than with any other brand.*

TEXACO

PROGRESS AT YOUR SERVICE

THE TEXAS COMPANY

We Must Speak for Ourselves

(Continued from page 42)

of our business. We must do more to remedy this deficiency. The authoritative explanation of fundamentals cannot be left to a handful of public-relations men. It is a job for everybody in our great industry.

I believe that responsible oil men everywhere are going to work—and work hard—in the months ahead to make this new organization a success. That is why I am confident that the Committee on Public Affairs and its state affiliates can be counted on to do a better job in governmental and public relations that we have yet seen in our industry. END

Plaque containing resolution of American Association of Oilwell Drilling Contractors, commending Hughes Tool Co. for its research program, presented in Houston by J. U. Teague, president of AAODC, to M. E. Montrose (left) vice president-sales, and Dr. Daniel J. Martin, vice president-engineering, and responsible for Hughes research.

Commend Hughes Tool

Hughes Tool Co. has been commended for its 50 years of research in rotary drilling by the American Association of Oilwell Drilling Contractors. In expressing appreciation to the association for the plaque presented, M. E. Montrose, vice president-sales also commended the drilling industry for its close cooperation in supplying data from more than a half million bit runs annually. He pointed out that the tabulation of this information is proving invaluable to drilling contractors. It is giving them an accurate picture of the performance of various types of bits under all possible drilling conditions, and thus is the basis for Hughes recommendation of bits providing the best performance for each job.

Clark Armstrong-Siddeley Agreement

A new manufacturing agreement has been signed between Armstrong Siddeley Motors Ltd. and Clark Bros. Co. Division of Dresser AG. Terms of agreement provide for licensed manufacture in the United Kingdom of gas turbines designed and made by Clark in the USA.

New Clark Bros.-Armstrong Siddeley agreement provides for British manufacture of Clark-designed gas turbines. Shown at signing ceremony in Paris are, left to right: F. T. Blakely, secretary of ASM; H. T. Chapman, CBE, managing director of ASM; A. Thomas, MBE, deputy chief engineer and chief designer of ASM; R. R. McCartney, vice president in charge of overseas operations of Clark Bros. Co., USA; R. Chesneaux, president of STE, Française des Industries Dresser SA; and M. J. Galpin, manager of Clark Bros Co., England.

Platinum-Catalyst Plant

Cyanamid-Ketjen NV, Amsterdam, has completed a platinum-catalyst plant for the production of ultraforming catalyst under a license from the Standard Oil Co. of Indiana. Early output is being shipped to new Esso Powerformers in Europe, Africa, and Asia. It will also serve ultraformers in the Eastern hemisphere.

The new plant adjoins Ketjen's earlier plant built to produce other catalysts including Ketjencat m.s. fluid cracking catalyst, Ketjenform, for hydroforming and Ketjenfine for hydrodesulfurization. The new ultraforming catalysts will be of the 0.3% and 0.6% types, identical with those manufactured by American Cyanamid.

Dresser Earnings Up 33%

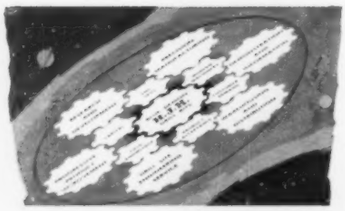
Dresser's earnings were up 33% over the previous quarter, despite slight sales decline in third quarter of 1958. Net earnings after taxes for the third quarter of the fiscal year were $2,447,000 on sales of $55,479,000, compared with earnings of $5,217,000 on sales of $71,211,000 for the same period a year ago.

Gulf in Politics

Gulf Oil Corp. has declared its determination to take an increasingly active interest in practical politics, especially in such areas as it can oppose labor's mounting political power.

Gulf's management stressed that labor's attempts to influence legislation called for opposition from a matching force, "and there is no place in the United States where such a force can be generated except among the corporations that make up American business."

Gulf's statements were contained in a letter to employees and shareholders published in a company magazine, *The Orange Disc*. It was signed by Senior Vice President Archie D. Gray, whose responsibilities include the company's law problems and its employee and public relations.



. . . geared for greater shot hole drilling progress in the International Geophysical Year

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MADE INTO "BLUE DEMON" BITS

Engineered specifically for seismic operations, Hawthorne "Blue Demon" Bits are precision made of highest quality materials . . . to provide maximum drilling efficiency at lower cost-per-foot . . . with every set of replaceable blades . . . on every hole you drill.

A proven product of constant performance research, interchangeable "Blue Demon" Blades are forged of high yield alloy steel to stand the greatest strain on bottom . . . wear-resistant tungsten carbide inserts are uniformly brazed on cutting edges . . . consistent heat-treating is controlled for maximum structural strength . . . and blades are ground to exacting specifications which permit the fastest cutting characteristics without sacrifice of life.

Precision machined alloy bit connectors, for pin or box connection, are provided for all standard drilling equipment, for permanent use with many sets of blades.

Continuing Hawthorne plant expansion is your assurance of a plentiful supply of "Blue Demon" Bits, in all popular sizes, for prompt delivery in every drilling area . . . to provide your drill with field proven, faster, more efficient footage . . . cleaner, more economical hole.

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Two String Penetration Successful with M-3 Gun, Ogival Bullets

McCullough M-3 Bullet Perforator Makes Good Well After Bullet Gun of Another Make Fails

After an unsuccessful attempt to get penetration by another service company, this Texas oil well was perforated by a McCullough M-3 Bullet Gun for a good producer.

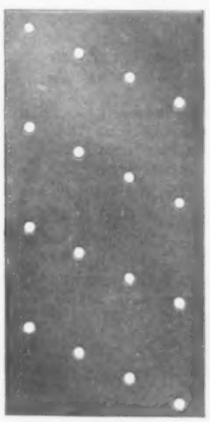
Depth of operation was 5600'. A 5" OD 18 lb. liner had been cemented in 7⅝" OD 29.5 lb. casing which was cemented in open hole.

When first perforated by another make bullet gun, the well failed to respond. McCullough was called and a 3½" OD M-3 Bullet Gun fired 18 improved ½" Ogival Bullets, six per foot, in a three foot zone. Results—a good well and a very satisfied oil man. Time on the job was only two hours.

The greater penetrating power of McCullough M-3 Bullet Perforators has been proved time after time on jobs like this—penetrating two or even three strings of casing, through thick cement sheaths and deep into the producing formation—getting production or increasing production even after others have failed.

For most profitable perforating results—call for hard-shooting McCullough M-3 Bullet Guns.

The job described above is certified to be a true field report of service rendered.



Section of 5" OD casing, unrolled and laid flat to show uniformity of perforation pattern of McCullough M-3, 30-shot Bullet Gun—½" diameter holes, six shots per foot.

McCullough 30-shot M-3 Bullet Perforator. Fires all shots, one to six per foot, at one time. Three or more guns may be connected together and fired on one run.

UNIFORM PERFORATION PATTERN

... means a better oil well

One of the most valuable benefits of McCullough M-3 Bullet Perforating is the uniformity of the perforation pattern in the casing and formation. Shots are placed in a continuous spiral with uniform spacing, coinciding exactly with the pattern of the bullet chambers in the gun itself.

This permits the safe use of more holes per foot in the casing and eliminates the possibility of bunching or scattering the shots. It assures complete, uniform perforation coverage of the entire productive zone, provides maximum drainage area, best possible production.

The uniform perforation pattern combined with the fracturing power of McCullough Ogival Bullets at four to six shots per foot provides ideal conditions for further formation fracturing.

McCullough® TOOL COMPANY

Cable Address: MACTOOL

LOS ANGELES
HOUSTON
EDMONTON

OIL COMPANY STAFF CHANGES

I. H. Hughes

D. Proctor

R. O. Rhoades

G. W. Wyckoff

I. HAYDEN HUGHES has been appointed general manager of Pan American International Oil Co.'s operations in Argentina, according to an announcement by Mr. C. F. Dohm, president. Mr. Hughes will establish a headquarters office for Pan American International from Sunray Mid-Continent Corp., where he was a vice-president. He has had extensive experience in South American oil activities, having served for seven years as chief petroleum engineer, operations manager, and assistant general manager for operations of the International Petroleum Co. in Venezuela, Peru, and Colombia, and for two years as field manager for Phillips Petroleum in Venezuela.

Pan American International Oil Co. has recently signed an agreement with YPF, Argentine state oil organization, covering development and operation of certain areas in Patagonia and Southern Argentina.

K. W. BRILL, New York, has been elected a vice president of Continental Oil Co. Formerly he was asistant to the vice president.

Mr. Brill joined Conoco in 1930 at Ponca City, Okla. Before transferring to New York in 1957, he served for four years as Conoco's central region general manager at Oklahoma City.

R. A. HUNTER has been elected administrative vice president, marketing department, Gulf Oil Corp. He will continue as coordinator for all marketing. In his new position, Mr. Hunter will be responsible for the administration of marketing department affairs and for coordinating them with other company departments involved. In addition, Mr. Hunter has also been named chairman of the marketing council, the Gulf group primarily concerned with matters relating to the marketing effort.

FRED C. KOCH has been elected a director of Universal Oil Products Co. increasing the board to nine. Mr. Koch is chairman of Koch Engineering Co., Inc., of Wichita, Kas., and a director of the First National Bank of Wichita. He has been associated with the oil refining industry in various capacities since 1924. He is a member of the corporation of Masschusetts Institute of Technology and a director of Northern Natural Gas Co., Omaha, Neb.

D. C. DUNAWAY has been elected president of American Independent Oil Co., succeeding **RALPH K. DAVIES** who has been elected chairman.

Dr. JUDSON L. ANDERSON, geologist and engineer, has joined the oil and gas department of Chemical Corn Exchange Bank, New York. He has been associated with Lago Petroleum Corp. of Venezuela, with International Petroleum Co. of Colombia and Peru, with Sinclair Oil Co. in southwest Africa, and with Ralph E. Davis of Houston.

MAX L. PASSANTE has been appointed director of foreign operations for Lion Oil Co., division of Monsanto Chemical Co. Mr. Passante obtained his doctor's degree in geology from the University of of Rome, Italy, in 1937. He has practiced his profession since 1938, doing oil and gas exploratory work in various areas of Europe, South America, and the United States.

ANDREW G. ALPHA has been transferred to the general offices of Signal Oil and Gas Co., in Los Angeles, as exploration coordinator. He had been with Signal's Denver office since 1953, when he joined the company as geologist for the Rocky Mountain area and Canada.

RALPH O. RHOADES, Gulf director and senior vice president, has been elected executive vice president of Gulf Oil Corp., succeeding David Proctor who was elected chairman, a post which has been vacant since 1957. **GEORGE W. WYCKOFF**, Pittsburgh business and civic leader, was elected director. Mr. Wyckoff is currently a governor-vice president of T. Mellon and Sons in Pittsburgh.

Mr. Rhoades was elected a vice president in 1951 and in June 1953 was placed in charge of world wide exploration and production activities.

Mr. Proctor is a veteran employee with more then 39 years with Gulf. He started his career as a lawyer in the Fort Worth office in 1919 and first came to Pittsburgh in 1937. He was elected vice president and general counsel, but resigned as general counsel to devote more time to his executive vice presidential duties. He is a member of the board of the American Petroleum Institute and the National Petroleum Council.

LEWIS H. WARE has been appointed executive assistant to the company's management of Ashland Oil & Refining Co., Ashland, Ky.

GERALD McGREW has been elected a vice president of Cities Service Oil Co. (Del.). He steps into the vice presidency from managership of the company's crude-oil supply division. Earlier this year, his duties were expanded to include certain additional management responsibilities. He was elected a director in 1955.

P. W. McFARLAND, formerly division chief geologist, has been appointed exploration manager for Sun Oil Co., at Caracas. **L. C. SMITH** was appointed division chief geologist; **L. M. RUCKER**, promoted from district paleontologist to regional paleontologist; **J. A. WALLER**, promoted to division geophysicist; **R. C. WEART**, named research geologist.

Venezuelan Sun Oil Co. named **C. E. LEHECKA**, former district geologist, as regional geologist at Caracas; and **J. D. TAYLOR** Maracaibo district geologist, and **D. W. SIMMONS** eastern Venezuela district geologist.

In Colombian Sun Oil Co., **E. C. ROBINSON** has been promoted from geologist to district geologist at Bogota.

Dr. HENDRIK J. MORSMAN has joined the Athens, Greece, office of George Armistead & Co. as assistant manager. In the capacity of technical advisor to the Greek government, the Armistead organization has assisted in the erection of this refinery and the preparation for initial operation. It is expected that operation will begin during the latter part of 1958. Dr. Morsman was formerly process superintendent for Great Northern Oil Co. at St. Paul, Minn., and previously served with Shell Oil Co. in the Caribbean in South America. He will be concerned with administrative and economic features of the refinery operation.

Dr. H. J. Morsman

C. M. Lynch

E. J. McDermott

T. T. Wilkinson

JOSEPH ST. G. B. NOLAN

Standard-Vacuum Oil Co. has announced the death of Joseph St. G. B. Nolan, 65, a former member of its headquarters staff and the first South African-born head of the company's oldest South African subsidiary.

Mr. Nolan, who died in Cape Town, September 7, had retired February 1, 1958, after 47 years of company service. He was elected managing director of the Vacuum Oil Co. of South Africa in 1950 —the first locally-born citizen to become the head of any major oil company in the Union of South Africa.

LLOYD G. SMITH

Lloyd G. Smith, a retired vice president and director of Creole Petroleum Corp., died, September 9, at his home in Media, Pa., of a heart attack. He was 67 years old.

J. D. WELLS has been named chief production engineer and C. CLARK FULLER, Jr., staff engineer, for Pan American International Oil Co., they will be assigned to the firm's New York office.

CHARLES F. BEDFORD has been elected vice president in charge of production and a director of Pan American International Oil Co., a wholly owned subsidiary of Pan American Petroleum Corp.

Mr. Bedford was formerly general superintendent, producing department, for Pan American Petroleum in Tulsa. He has assumed his new duties at the New York headquarters of the international firm.

Pan American International, headed by C. F. Dohm, has headquarters in New York and a foreign office in London. It was formed early this year as the Eastern Hemisphere subsidiary of Pan American Petroleum.

CHARLES J. BRYCE has reported to Venezuela headquarters of Brown Drilling Co. at Maracaibo, Venezuela. Mr. Bryce formerly was superintendent with McFarland Drilling, of Midland, Texas.

M. F. GRANVILLE has been appointed general manager of The Texas Co.'s petrochemical department at New York. He formerly was superintendent of the chemicals division at Texaco's largest refinery, at Port Arthur, Texas.

E. G. SCHEMPF, president of Precision Exploration Consultants Ltd., Tulsa, is in Spain for conferences with executives of Comision Investigaciones Petroliferos Valledro, and to consider organizing a French company to carry on geophysical work in France and throughout French concessions. Mr. Schempf and **NORMAN J. CHRISTIE** also represent newly formed Precon, a worldwide exploratory firm formed with Consolidated Geophysical Surveys, of Tulsa.

E. J. McDERMOTT, senior manager of operations and chartering of Sinclair Refining, has been appointed marine manager, succeeding **CAPTAIN H. R. ADAMS**, retired. Mr. McDermott will continue to be responsible for vessel chartering. **C. M. LYNCH**, manager of safety and training was elevated to senior manager of operations, New York; **T. T. WILKINSON**, superintendent engineer, to manager of engineering; and **D. D. MacDERMOTT**, manager of the Great Lake division, Chicago, promoted to administrative assistant to the vice president for Inland Waters and Great Lakes Operations. **J. T. DREITLEIN**, manager of operations for Inland Waterways was appointed manager-operations for Inland Waterways and Great Lakes, with headquarters in St. Louis.

"Public understanding of what American oil companies are doing overseas and why their work is important to every citizen is to be desired. We would like more people to know about our activities. We would like them to realize we try to be good guests in host countries. We would like them to appreciate that our operations represent the American brand of private enterprise in many critical areas where the demonstration of these principles has a great effect upon our country's relations with the rest of the world."

M. J. Rathbone, President, Standard Oil Company (New Jersey)

ESSO

STANDARD OIL COMPANY (NEW JERSEY)

AND AFFILIATED COMPANIES

GUY B. HUNTER, chairman of Quaker State Oil Refining Corp., Oil City, Pa., was re-elected president of National Petroleum Assn. at the recent 56th annual meeting at Atlantic City. **REXFORD S. BLAZER**, of Ashland Oil & Refining Corp., Ashland, Ky., was elected first vice president; and **JOHN E. SELDEN**, of Penzoil Division, South Penn Oil Co., Oil City, Pa., was elected second vice president. Mr. Hunter was re-elected treasurer, a post he has held for many years; and **O. P. KEENEY**, of Oil City was re-elected recording secretary.

GEORGE W. FIELD has been named manager of exploration for Cities Service Oil Co.'s southern division, to succeed **H. BEN COX** of Houston, who retired October 1. **PERRY E. BARNHART**, of Lafayette, La., succeeded Mr. Field as southern division geologist at Houston.

WILLIAM NADEN has been elected president of Esso Standard Oil Co., New York, effective August 1. Formerly executive vice president, Mr. Naden succeeds retiring Stanley C. Hope, president since 1949. Esso Standard, wholly owned SONJ subsidiary, conducts refining, marketing, and transportation operations in the East and South.

Mr. Naden joined the company in 1927; became general manager of manufacturing in 1949; vice president in 1950; and executive vice president in 1955.

C. WILLIS STOSE has been appointed manager of the Philadelphia refinery of The Atlantic Refining Co.—succeeding D. T. Shaw, retired after 29 years' service, Mr. Stose joined Atlantic's research and development department in 1925, and in 1957 was named general superintendent of the Philadelphia refinery.

PAUL E. McGOVNEY has been promoted to vice president of Honolulu Oil Corp., San Francisco, as manager of the company's Canadian operations, as well as manager of exploration activities in the northern Rocky Mountain division.

LEWIS A. WINKLER has been named head of Esso Research & Engineering Co.'s chemicals liaison unit, headquartered in London. **LEO V. MULLEN** is now a section head in charge of additives activities.

GRANT E. JUDGE, consultant in petroleum tax matters, has joined the F. A. Callery firm of Houston independent oil operators. He had been a partner in the auditing firm of Arthur Andersen & Co.

CHARLES M. KITRELL has been appointed manager of the newly established New York office of the supply and transportation department of Phillips Petroleum Co. He formerly was assistant manager of the department at Bartlesville, Okla. C. M. McCORMICK has been named assistant to the manager of the supply division; and L. A. WHITEHAIR (formerly assistant to the manager of the pipeline division) has been appointed industrial-relations director of the department—replacing Mr. McCormick.

GEORGE E. MAYS has been assigned to Hamburg, Germany, as assistant to L. W. Finlay, shareholders' representative for Standard Oil Co. (N. J.) in Germany, Belgium, and The Netherlands, and chairman of the company's coordination committee for Europe.

JOHN C. ANDERSON has been appointed controller of The Vickers Petroleum Co., Inc., Wichita, Kans. Under the direction of Thomas F. Dowd, Jr., vice president (finance), Mr. Anderson will take charge of Vickers' newly formed controller division and supervise the accounting, traffic, and purchasing departments.

JACK E. HUGHES has been appointed chief geologist of Drilling & Exploration Co. Inc., Dallas, Texas, and will head up the company's geological activities. He was formerly chief geologist for D. D. Feldman, and there too he served in various geological capacities for Atlantic Refining Co.

L. C. RITTS, JR., has been appointed manager, exploration operations, for Pan American Petroleum Corp., in Tulsa. He will be responsible for coordination of exploration operations in the USA and Canada.

HARRY F. HUF has been appointed general manager of the engineering and construction department of The Atlantic Refining Co., Philadelphia, Pa. He has been a member of the department since 1935, and for the past four years has served as administrative manager. Mr. Huf succeeds Dr. L. M. Goldsmith, retiring after 42 years with the firm.

HOWARD W. WRIGHT, JR., vice president of Southwestern Engineering Co., Los Angeles, has been named general sales manager of the company.

WILLIAM H. HESKETH, who recently completed an assignment as acting manager of the Stanvac refinery in Bombay has been named president of Standard-Vacuum Refining Corp. (Philippines). Stanvac is building a refinery costing about $33.5 million on the Bataan peninsula.

MARTIN H. MITCHELL has been appointed general manager of Tidwater Oil Co.'s operations in Pakistan. From his headquarters in Karachi, he will direct oil exploration on concessions totaling 10,000 square miles in West Pakistan—held by Tidewater as operator for itself, Skelly Oil Co., Kewanee Oil Co., and the government of Pakistan. Mr. Mitchell previously served two years as general manager of Tidewater's exploration and production operations in Turkey, and prior to that was manager of the company's western division land department.

E. F. BULLARD has been elected chairman, and **A. L. SOLLIDAY** president, of Pan American Petroleum Corp.

In other executive changes F. R. Yost was elected executive vice president, and C. F. Bedford vice president-production.

Mr. Bullard becomes Pan American's second chairman. The post was held by F. O. Prior for a time in 1945, but has been vacant since then.

Mr. Solliday, who becomes the third president in Pan American history, also came up from the Dixie company, which he joined in 1923 as a geologist.

MARLIN E. SANDLIN has been elected executive vice president of Woodley Petroleum Co., and **E. David Philley** has been named general counsel at Houston, Texas.

JAMES S. PATTERSON has been appointed manufacturing superintendent of International Petroleum Co. at Talara, Peru. He succeeds Cornelius F. Burk, retired.

CRAIG THOMPSON, veteran newspaperman and free-lance writer, has been appointed director, public relations, for the Gulf Oil Corp. He succeeds W. R. Huber, recently retired. Mr. Thompson has done considerable free-lance writing for Gulf during the past eight years.

LLOYD J. BECKMAN has been elected secretary and a director of Cities Service Oil Co. (Del.) He succeeds F. B. Plank, retired.

R. M. BARTLETT, vice president, foreign crude-oil sales, Gulf Oil Corp., retired Sept. 1. He is a veteran of 32 years of service with the company.

J. N. BIRON has been appointed senior vice president of International Drilling Co., and has been transferred to the company's London offices.

B. G. Frazier has been appointed vice president in charge of engineering, and O. D. Blankenship has been named assistant to Monty R. Garrison, at Rome. Wallace March and Mr. Garrison are joint managing directors at Rome headquarters.

C. C. McMullen, Aramco; H. Leonard, Blaw Knox; B. Frihart, Cities Service.

NOMADS GOLF WINNERS

Those who won prizes at the fall golf party of the New York Chapter of NOMADS, held at Siwanoy Country Club, Bronxville, N.Y. September 16, included: A. Cashman, Keenan-Cashman Co.; H. Leonard, Blaw-Knox Co.; J. Chanda, A.O. Smith Corp.; J.P. Feagley, Youngstown Sheet & Tube; B. Frihart, Cities Service; C.C. McMullen, Aramco; E.R. Smoley, Lummus; C. McCollub, National Supply; H.W. Snady, Aramco; B. Chadderdon, International Tool & Supply; F.W. Stopinski, Esso Standard Oil; E.E. Benninger, Baker Oil Tools; J.S. Moore, Chain Belt Co.; and E.W. Hoeppner, Hughes Tool Co.

J.E. (Jack) George won the president's cup, which is given to the Nomad having the lowest gross scores for the combined spring and fall golf parties.

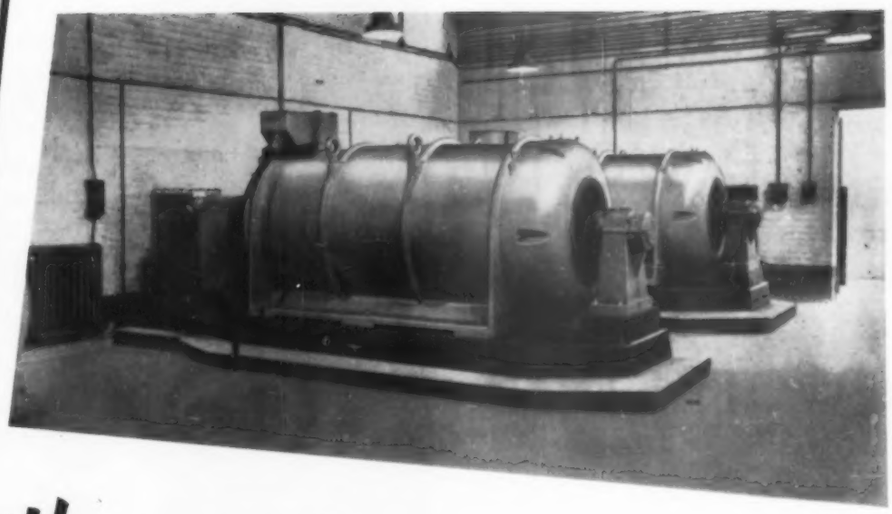
A. B. Cashman, Keene-Cashman Co.; J. Chanda, A. O. Smith Corp; J. P. Feagley, Youngstown Sheet & Tube.

F. W. Stopinski, Esso Standard Oil Co.

Herb E. Maland, R. J. Eiche & Associates Inc., presents J. E. George (right), Mid-Continent Supply Co., the president's cup.

E. R. Smoley, Lummus Co.; C. McCollum, National Supply; H. W. Snady, Aramco.

Two Mather & Platt 1000 b.h.p. flameproof induction motors driving oil pumps.



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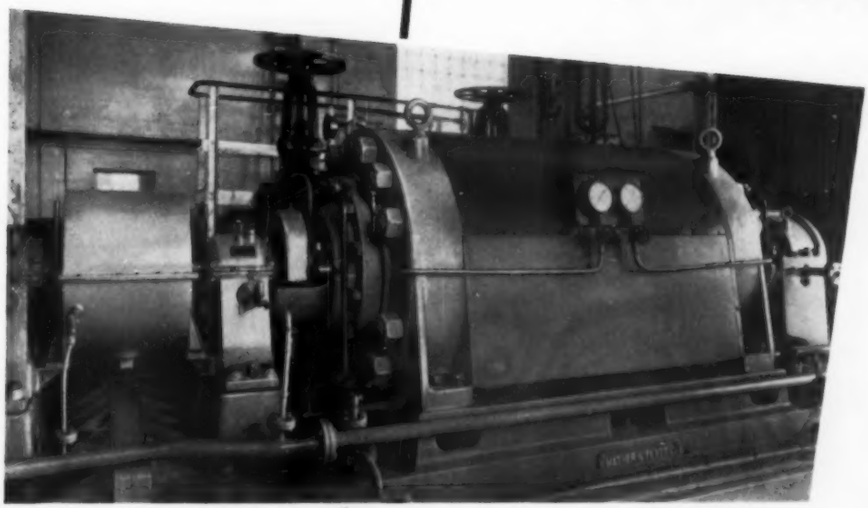

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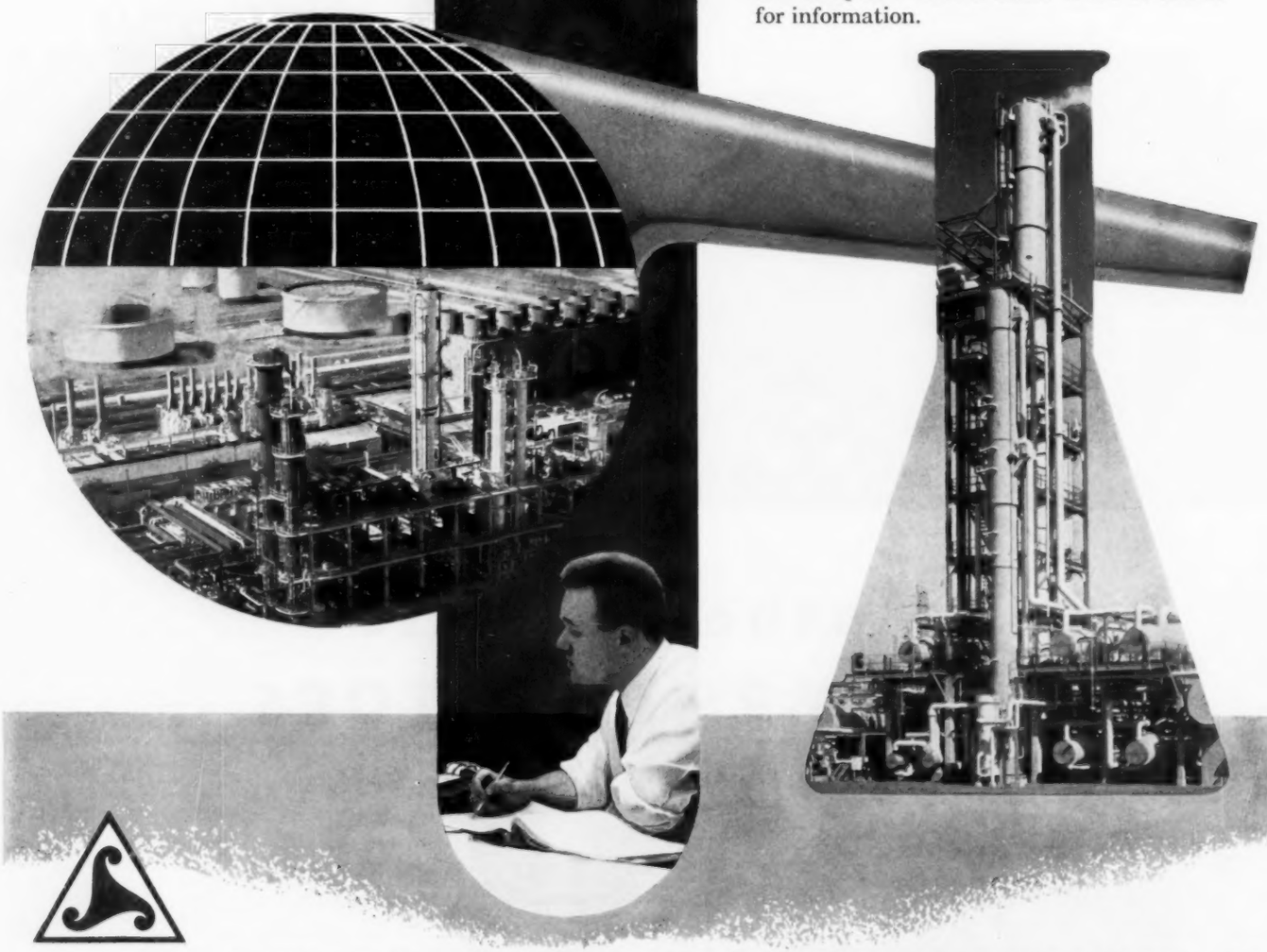

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Aden, Bombay, Cuba—we could equally well start with Amuay, Antwerp, Bahrain, Cardon, Cubatao—or go back to Abadan—or even to Astra-Romana of the 1920's, then on through some 40 oil refineries to Visakhapatnam.

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INTERNATIONAL NEWS AND NOTES

To Quit Cuba

Indications are that Cuban Stanolind Oil Co., subsidiary of Standard Oil of Indiana, will accept its penalty and quit Cuba. The company has drilled a number of dry wells and is currently on another, Puerto Padre No. 1, on the Yoyo concession.

Spain Relaxes Monopoly

For the first time in some decades, Spain has relaxed slightly the internal monopoly of the State over sales of petroleum and products within the country. New regulations governing the sale and supply of oil products (promulgated in the *Boletin Oficial* of August 7, 1958) have as their objective an increase in the number of filling stations serving Spain's increasing vehicle population, and a significant change is made in transferring much of this to private hands and out of the State's monopoly, CAMPSA. Provision is made for construction of stations with private participation; and, where formerly such "mixed" stations reverted to the State in 40 years, they now revert in 40, 65, or 75 years depending on whether they are 1st, 2nd, or 3rd-class. Also, at the end of such period, the private operator can continue, on payment of a tax, to operate the station.

First Deep Test Well in Malta

Drilling of first deep test well in Malta by BP Exploration Co. was scheduled to begin September 1. The well, which was to be drilled near the village of Naxxar, about four miles northwest of Valetta, will be known as Naxxar No. 2. A shallow exploration well was drilled in the vicinity in 1955. A drilling rig capable of reaching a depth of 15,000 ft has been brought from Sicily where BP is searching for oil. Early this year the Maltese government granted BP a new license to explore for oil in the Maltese islands. Previously the company had carried out, under license, a geophysical survey of Malta.

Austrian Oil Production

In an effort to reverse the present decline in Austrian crude production, several oil companies, among them BP, are now prospecting for new oil reserves there. BP is doing so through a joint venture with the OeMV, the Austrian State Oil Administration. Agreement on formation of this venture, known as the Arbeitsgemeinschaft OeMV-BP, was reached in 1957 and, after preliminary geological studies, a seismic survey in the Scheibbs area in Lower Austria began this year. The survey is being carried out by a contract party, and is expected to last six months. The joint venture, in which BP's 50% share is held through BP Exploration Co., covers at present only the two small concessions of Scheibbs and Amstetten—a total area of about 2,000 sq km; but the agreement provided for extension to other areas if these become available. Marketing of any crude produced will be by BP's marketing subsidiary, OeMV and BP-Benzin und Petroleum AG.

New Oil Show in Nigeria

Shell-BP have struck oil in an exploration well drilled in the eastern region of Nigeria at Obigbo, in Afam division, 10 miles northeast of Port Harcourt. The well, which reached a total depth of 11,446 ft, is now on test production. Drilling began at the end of April this year. The rig has now been moved to a new location at Ebubu, in Ogini division, 10 miles due east of Port Harcourt, for the drilling of another exploration well.

New Test Well in Libya

Drilling of a second deep test well in Libya has been begun by D'Arcy Exploration Co. (Africa) Ltd., one of BP's prospecting subsidiaries. Known as Wadi Zachem No. 1, the well is sited about 30 miles south of Hon, and 190 miles S-SW of Sirte. The company's first deep test well, Castel Benito No. 1, 30 miles south of Tripoli, was abandoned in August at 3,500 ft.

Kuwait Expands Gathering

Development of the Burgan oil field has necessitated expansion of oil-production facilities so as to bring further completed wells into the system. Accordingly, two new gathering centers, No. 12 and 13, have recently been commissioned. This brings up to 11 the number of gathering centers serving the 211 wells in the Burgan field. Two gathering centers serve the Magwa-Ahmadi fields to the north where, at the end of June, there were 76 wells.

Construction of No. 12 gathering center began in May 1957; it was commissioned February last. Oil from about 20 wells enters through separate flow lines. The oil thus collected is directed into gas-oil separators installed in pairs so that incoming oil flows through one high-pressure and then through one low-pressure separator. Eventually, the degassed crude is pumped to the tank farm at Ahmadi.

The gas separated from the crude is used in the field fuel system which supplies both the State and the company. Among other uses, it supplies two gas combustion turbines, having a maximum rating of 965 bhp in an ambient temperature of 125 F, which power the crude-oil transit pumps.

No. 12 gathering center has a potential capacity of 180,000 b/d. No. 13 in the southwestern end of the field, which is similar in design and operation, was commissioned in June.

Phillips Expands in Algeria

New concession awards to group consisting of Phillips Petroleum and two French companies, COPEFA and OMNIREX, include one known as El Atchane comprising 1,748,260 acres southwest of Hassi Messaoud. Phillips, which has 49% interest, will be operator; geophysical operations will begin soon. The other award, in which Phillips has 25%, comprises 1,433,203 acres in Sahara Desert adjacent to Tunesia. Known as Beressof, concession is northeast of Hassi Messaoud. Exploration is to begin soon by the operator, COPEFA.

New Shallow Find in India

Government spokesman has expressed enthusiasm over new shallow oil find in Gambay, coastal area north of Bombay. With Russian and Romanian aid, drilling started July 25 with a Russian Uralmash-3D turbo drill. When drilling ceased, September 3, for electric logging, well was at 5,368 ft. With resumption of mud circulation, oil mixed with mud flowed steadily for 15 minutes, at heavy bottom-hole pressure of 190 atmospheres. Because of shallow depth and low cost in this virgin area, Indians expect soon to sink more wells.

French Rubber Plant

The first plant in France for the manufacture of synthetic rubber is to be built at Berre, near Marseilles. Three companies will be concerned in this development: Shell St. Gobain (in which the Royal Dutch-Shell group has a 60% interest) Michelin, and Cabot-Texas Butadiene. The new plant, which will have a capacity of 50,000 tons a year, is to be situated in the vicinity of the Shell Berre refinery, the St. Gobain chemical plant, and the Cabot carbon-black plant from which sources it will draw its raw material. Production is expected to begin in 1961.

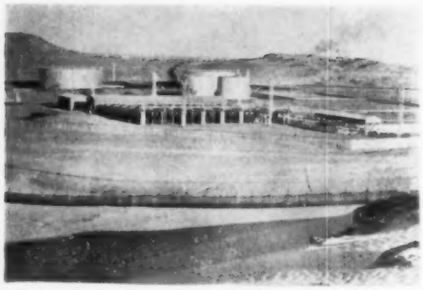
Pakistan Gets Gwadur Port

Oil prospecting in West Pakistan is expected to increase considerably now that dispute between Pakistan and Sultan of Muscat & Oman over seaport of Gwadur has been settled amicably. It is expected the sultan may soon receive a substantial sum from the Pakistan government for the port.

Getty Enters Italy

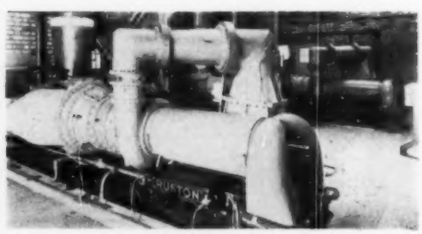
J. P. Getty has entered the Italian oil industry through the purchase of a substantial interest in the GOLFO refinery in Gaeta Bay in southern Italy. Capital of company has been increased from 1,500 to 2,000 million lire, and the present 30,000 b/d plant capacity also is to be increased. Crude for the plant will be obtained from Getty properties in the Kuwait Neutral Zone.

Carlo Boatti continues as president of GOLFO. Eugene P. Getty has been elected vice president and general manager. Other managers are A. Volpato, M. Oberti, and C. F. Farbach.



A general view of one of the gathering centers in the Burgan field, Kuwait.

One of the horizontal gas separators with a Kuwaiti operator at the controls.



Interior view of the pump house at Kuwait Oil Co.'s No. 12 gathering center, showing the two Mark TA Ruston gas-turbine installations. Two further turbines are installed at gathering center No. 13, and one at No. 11.

Kenya's 2,000 B/D Refinery

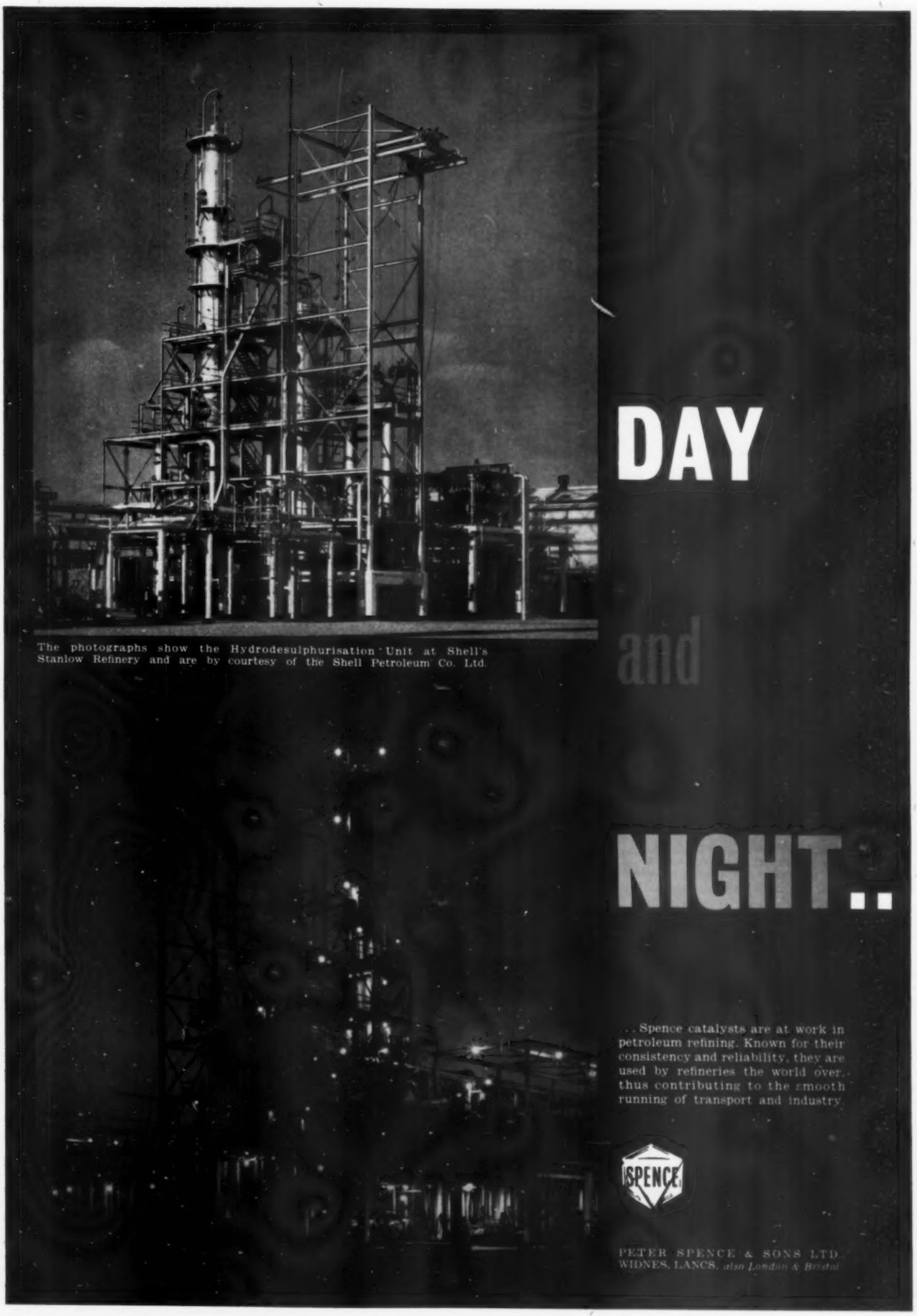
Luanda refinery in Kenya, British East Africa, is reported operating at 2,000 b/d capacity and furnishing all local requirements for fuel oil and a third for gasoline and gas oil. Local refining should save $2.5 million annually for imports, and sale of excess fuel oil to ocean-going vessels another $1 million.

Austria's Oil Consumption Up

Domestic consumption of oil products in Austria reached 938,000 metric tons in January-June 1958, compared with 860,000 in same 1957 period. Total 1957 consumption was 1,892,000 tons; 1,790,000 in 1956. First-half 1958 motor-gasoline consumption was 15% higher than in 1957, gas-diesel 13% higher, fuel oil 3% higher.

Romania to Aid India's Refining

Indian government representative was to sign contract in Bucharest in September for government-owned $23.1 million oil refinery at Guahati to operate on Assam crude. Romania, which is to finance project, will receive long-term repayment through supply of Indian commodities. A second government-owned plant at Barauni in Bihar may also be considered for Romanian financing.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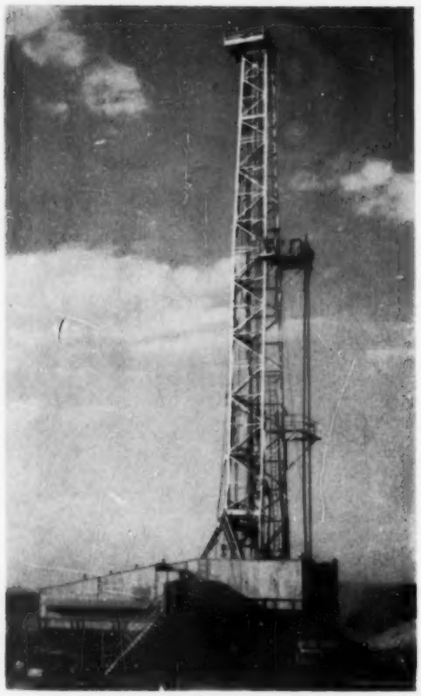
The photographs show the Hydrodesulphurisation Unit at Shell's Stanlow Refinery and are by courtesy of the Shell Petroleum Co. Ltd.



Iranian Wildcat

NIOC, the government's company, is completing Alborz No. 7 in the Qum area with this heavy National 80-B rig.

40,000 B/D Refinery at Algiers

Beryl Algérie Compagnie Française des Pétroles, Compagnie Française des Pétroles BP, Ste. Shell d'Algérie, and Standard Oil Co. (N.J.) have decided to form a company for early construction of an oil refinery near Algiers. Plant will be designed to treat Sahara crude oil and to yield all major products. The initial crude capacity will be about two million tons a year (40,000 b/d). This will be sufficient to meet Algeria's oil-product requirements which are estimated will amount to one million tons a year at the time the refinery comes onstream. The refinery will also make products available for export.

Two More Russian Finds

Soviet news agency reports discovery of two more oil deposits in the Tartar autonomous republic in European Russia. One near Elabuga yielded 175 tons per day.

Americans for Indian Refinery

Burma Oil Co. is reported to have accepted offer of American consulting firm for establishment of only one oil refinery to be located near Naharkatiya oil fields in India.

German Aid to Egypt

German mission will visit Cairo soon to study projects to be financed by 350 million German-mark credits of West German government. Of 22 oil projects proposed by Egyptian oil administration, 10 are to be implemented under terms of Soviet-Egyptian economic agreement, and 12 will be carried out by West German firms.

Japan to Market LPG

Japan is expected to begin marketing of LPGas. A group, with Misubishi Shoji Co. as leading member, is to be formed early next year for this purpose.

To Develop Spanish Concession

The German company Schactbau and Tiefbohr GmbH, which in 1957 produced 264,000 metric tons of indigenous crude, has now become a participant in the Spanish company Petrolifera Iberica. It plans an early test well on latter's concession area southeast of Bilboa, northern Spain.

Italy Slows Gas Production

Lack of new discoveries has slowed Italy's former rapid rise in natural-gas production. ENI's production totaled 2.3 billion cubic meters in January-June 1957; 2.6 billion July-December 1957; 2.4 billion January-June 1958.

Spain Modernizes Railways

Spain's five-year 1958-62 railway modernization plan calls for 50 mainline diesel locomotives, 162 diesel-electric, and 70 diesel-mechanical shunting machines.

Oil in the French Union

Search for oil in the French Union is expected to total 80 billion francs this year against 62.7 billion in 1957. Development costs (drilling, production, transportation, etc.) are estimated at 93 million francs this year, against 43.4 million in 1957. Meters drilled this year should total 850,000 against 502,000 in 1957. Crude production should reach two million tons, against 1,690,000 in 1957.

Australian Oil Shows

A mechanically successful formation test recently in the Goldwyer No. 1 well, 40 miles southeast of Broome, did not recover any formation fluid. The test followed oil showings in samples recovered between 2,900 ft and 2,965 ft. Cuttings from the well bottom had a faint yellow-brown stain. They showed strong green-yellow fluorescence under the ultraviolet lamp. The Goldwyer well, spudded in more than a month ago, was penetrating limestone with little or no porosity when the oil showings were noted.

Wapet's No. 1 Meda Well, 40 miles east of Derby, below 7,500 ft, produced brown-stained samples in July but no oil trace, and two gas showings without oil in August. Meda and Goldwyer are 200 miles apart.

Morocco's Crude Drops

Morocco's crude output dropped to 75,098 metric tons (1,500 b/d) in 1957 from 97,452 (2,000 b/d) in 1956; 102,456 tons in 1955; 117,948 tons in 1954. Producing wells totaled 94 at year-end 1957; 92 year previous. Ste. Chérifiènne des Pétroles reported 1957 natural-gas production of 3,375,645 cubic meters; 7,304,246 in 1956. Company processed 104,419 tons of crude in 1957; 98,441 in 1956. SCP completed 21 test drillings of 27,170 meters depth during 1957; 21 drillings totaling 34,590 meters in 1956. Ten of the 21 in 1957 were productive, a record for SCP.

New Guinea Results Discouraging

Though no decision has yet been reached, Netherlands New Guinea Petroleum Co.—BPM (Dutch-Shell), Stanvac, and Caltex—may have to discontinue exploration in Dutch New Guinea if no important new wells are discovered within next few years. Company is now prospecting 25 million hectares, so far with discouraging results. Production, which in 1954 had reached 550,000 tons, fell to 330,000 by 1957 and continues to decline.

Stanvac's Philippine Well

Ipil No. 1, Stanvac's second well in Cagayan basin, northern Luzon province, in the Philippines, was spudded June 7; reached final depth of 7,260 ft July 26. Tertiary limestone, underlain by basement, was present from 4,350 ft to 6,110 ft. Gas shows appeared within limestone section, and were being tested August 21.

West Bengal Well Dry

Jalangi No. 1, third exploration well of joint Indo-Stanvac project in West Bengal, was abandoned dry at 11,731 ft on May 6. Fourth well, Debagram No. 1, spudded May 24, was at 9,237 ft August 15. If latter is completed during 1958, Bolpur No. 1 will be started. No geological field parties have been active during 1958. Indian government's participation in venture is 25%.

Czechoslovakian Refinery

Planned refinery crude throughput for 1956 is 5.3 million tons. Product output will be three million tons motor fuels, including 915,000 gasoline, 1,850,000 diesel fuel, 100,000 motor and compressor oils, 83,000 other lubes, 105,000 asphalt, 20,000 lubricating fats, and 1,955,000 fuel oil.

Soviet Aid for Afghanistan

USSR has granted Afghanistan government $100 million 30-year economic credit at 2% interest for Soviet materials, technical assistance, etc.

East German Pipeline

Recently announced East German oil pipeline will run through Ukraine and Poland to Frankfurt-Oder area. Soviet crude will be used for plastics and other artificial-fiber production.

Polish Refining to Rise

With Soviet assistance, Poland will build refinery to process two million tons of Soviet crude in 1963-64; four million in 1966-67; and eight million from 1975 on. With construction to start in 1960, location has not been announced. Five present Polish refineries process only 750,000 tons yearly.

USSR Gas Production to Rise

Planned Soviet gas production is to increase 13 to 15 times over 1957 level in next 15 years—to 9,534 to 11,299 billion cubic feet per year. During 1959-65 at least 49 million feet are to be drilled for exploration. Present gas reserves, estimated at 353 trillion cubic feet, are believed world's largest. From 1959-65, about 40 main gas lines with total length of 16,146 miles are to be laid. Ten lines are to radiate from the North Caucasian gas fields.

China Drilling

China drilled 840,000 meters during the five years ended 1957.

Egypt Levies 3% Canal Surcharge

Surcharge of 3% has been levied on Suez Canal dues since September 1, to repay cost of clearing canal. About three years will be required to recover the $8.4 million involved. UK government has agreed in principle to reimburse British shipowners and charterers who pay the dues. Vessels of 35-ft draft can now transit the canal against former 34-ft.

Refinery for Mozambique

Manuel Queiros Pereira and Manuel Cordo Bullosa, two SONAP executives, have asked government permission to erect a 4,000 b/d refinery in Lourenco Marques, Mozambique. To be owned by Portuguese company with minimum capital of $1,732,500, capacity could be raised to 10,000 b/d.

Japan's Offshore Platform

Japan Exploration Co. has announced Japan's first offshore oil-drilling platform was officially launched in the Sea of Japan, August 25. Bought last spring from R. G. LeTournea Inc., of Longview, Texas, the $1.5 million self-contained platform was assembled with the help of Texas engineers at Tsuchizaki port, Akita prefecture. Drilling was expected to start off the coast of Michigawa oil fields early in October.

Formosa Alkylation Unit

Chinese Petroleum Corp. has awarded Badger Manufacturing Co., Cambridge, Mass., contract for design, engineering, and equipment of a sulfuric-acid alkylation plant to be erected at Kaohsiung, Taiwan, China. Plant will produce 600 b/d of very high-octane aviation alkylation initially with ultimate future capacity up to 1,000 b/d, and will greatly increase the production on Taiwan of 100-130 and 115-145 octane aviation gasoline.

The new plant, scheduled for completion in early 1959, will utilize a process licensed by Texaco Development Corp. The process plant employs a Stratco contractor, and provides for extensive fractionation of the alkylate.

The 175 ft. high Isobutane Fractionating Tower of The British Petroleum Company's new Alkylation Plant at Isle of Grain.

Britain's first alkylation plant goes on stream

The technician twists the valve that recently set Britain's first alkylation plant 'on stream'. This plant is part of The British Petroleum Company's Kent Refinery on the Isle of Grain. This BP Refinery now has the only complete unit for making Avgas in Britain. The new plant will produce 40 million gallons of Avgas a year.

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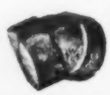

ROUGH FORGING AFTER TRIMMING

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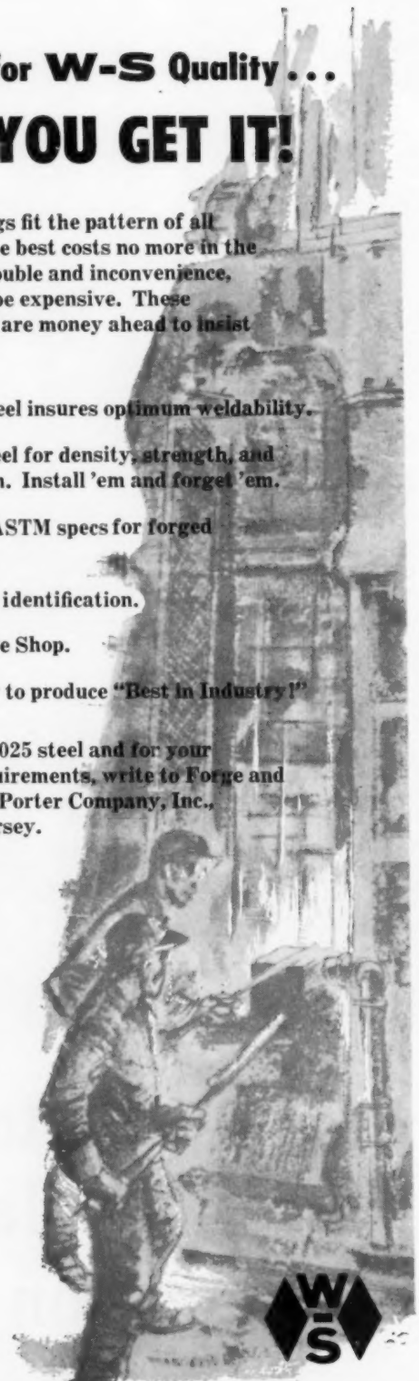

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World Oil Law & Concession Changes

(Continued from page 54)

ASTRA-YPF PRELIMINARY CONTRACT

Astra Cia. Argentina de Petroleo SA preliminary contract with YPF as follows: *Scope:* Astra to drill 30 wells for account of YPF to depths between 1,100 and 1,900 meters. *Area:* Comodoro Rivadavia, zones of El Tordillo, El Trebol, and Manantiales Behr at sites to be chosen by YPF. *Supervision:* Astra to be in charge of execution of all works. *Payment:* At unit prices in Argentine currency according to work performed; i.e., payment per meter of hole drilled and time employed. *Duration:* 24 months, operations to begin within 3 months of contract signature. *Contract:* Final contract to be signed when final agreement reached. This agreement to be annulled by such final contract.

BARBADOS

New income-tax bill is under consideration. It calls for 50-50 profits division.

BOLIVIA-BRAZIL

The former "Comision Mixta" area, by exchange of ministerial letters of March 29, 1958, was divided into two parts. Area *A:* 60% went to Brazil, and will be developed by Brazilian private capital (not Petrobras) or by joint Bolivian-Brazilian capital. The concessions granted in this zone are subject to the Bolivian oil law, and obligations will be same as in Zone 1 (Art. 20).

A complete rewrite of the Bolivian petroleum code has been proposed by left-wing members of congress. Their plan is part of a larger political fight, however, and not expected to result in major changes. A proposal to amend Art. 161 of the code to give the legislature power to approve contracts in YPFB's zone has more chance of enactment, but would have little effect since this power practically exists at present.

BRAZIL

The recent contracts in Argentina are being closely watched to see if the Frondizi administration can overcome opposition to them. Nationalist sentiment is still in favor of the Petrobras monopoly; however, the intensive drilling program Petrobras has conducted without results is causing doubts now. If oil is not found outside Bahia, where some small production exists, the situation may change in about 12 months or so.

BRITISH HONDURAS

Recent legislation includes the Oil Mining (Amendment) Regulations, 1958. It changes annual exploitation surface taxes per acre to range from British Honduras dollars 0.50 during the first year of the oil mining leases to BH $3.00 during the 10th and each subsequent year (35 US cents to US $2.1 approx.).

BRITISH GUIANA

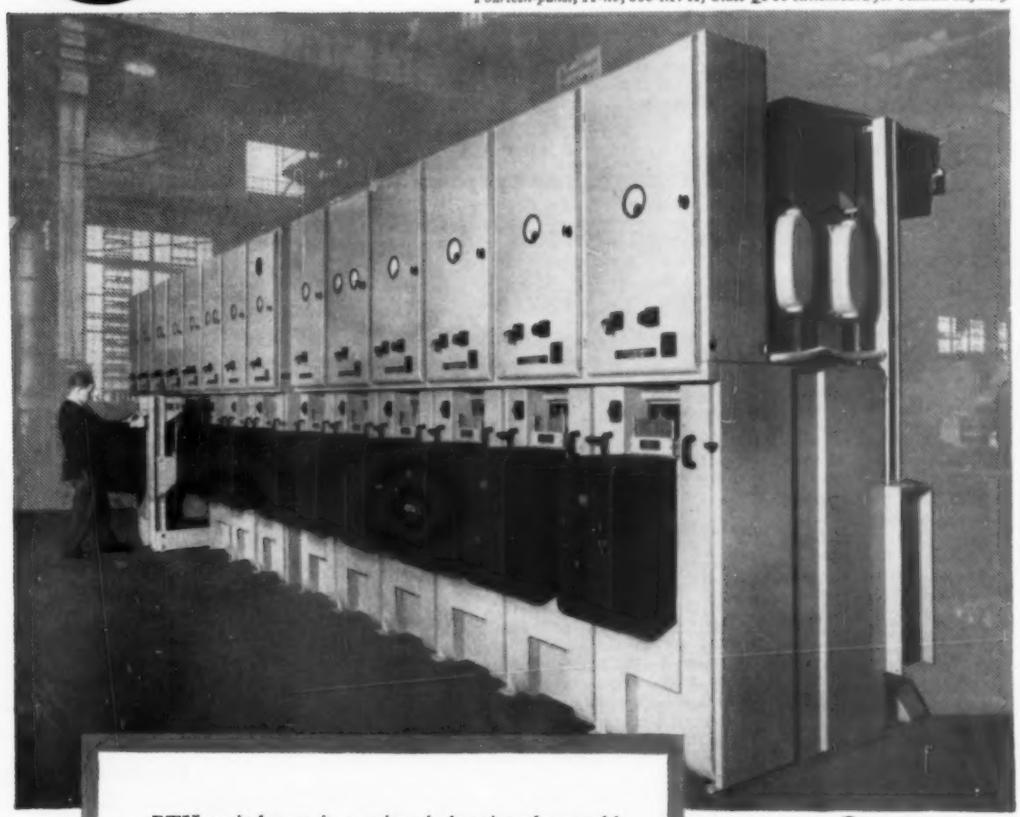
A large offshore concession has been granted to Standard Oil Co. of California via Dominion Oil Ltd.

Standard has agreed to invest at least US $200,000 in exploration in the next two years offshore, plus a narrow strip of the

(Continued on page 112)

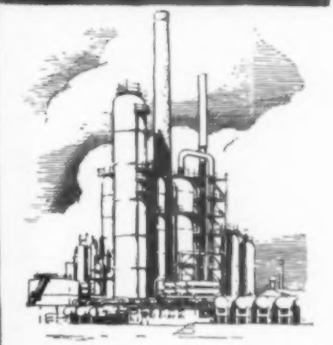
SWITCHGEAR FOR INDUSTRY

Fourteen-panel, 11-kv, 500-MVA, Class QF10 switchboard for Kuwait Refinery



BTH switchgear is serving industries the world over. A typical installation is at the Kuwait Oil Company's Refinery, for which eighty metal-clad equipments have been supplied to the order of E. B. Badger & Sons and G. Wimpey & Co.

BTH switchgear in the installation includes: thirty-three 11 kV, 500 MVA double-bus equipments and forty-seven 3.3 kV, 100/150 MVA single-bus equipments.



BRITISH THOMSON-HOUSTON

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(Continued from page 110)

coastlands. Also the company will construct a refinery of at least 100,000 tons a year (2,000 b/d) capacity if production reaches at least 200,000 tons of crude a year. Total payments to British Guiana will be less than 50% of net profits.

CHILE

Congress went into recess during August, and the oil bill will not come up for consideration for some time—probably about mid-1959. The latest draft still reserves the Magallanes area for the government's company, ENAP. Alessandri, the new president, has stated he favors entry of private oil companies in the same manner as in Argentina, but there are obstacles he may not be able to overcome. As things stand now, ENAP does not have the power to conclude contracts like YPF did in Argentina. The provisions necessary to give ENAP this power are not included in the draft law either, since it will not permit ENAP to contract out the Magallanes area.

COLOMBIA

Decree 282, recently issued, provides subsidy to refiners for difference between 6.0 pesos, the Central Bank's dollar buying rate, and whatever rate the refinery has to pay in auctions for dollars for crude purchases. Subsidy is paid by Ecopetrol, the government company; the decree also clarifies rate at which oil companies must sell dollars for pesos.

COSTA RICA

The new oil law has not yet been passed, and will not be for some months. The mining law draft is to be taken up before the oil law. The principal attributes of the draft oil law are:

Exploration: Basic unit of measurement is one map of the Geographic Institute on 1:25,000 scale. Maximum 32 such units for area of 400,000 hectares. Half exploration area must be surrendered at end exploratory period, and no more than 150,000 hectares may be retained. Exploitation lots are to be selected from one-fourth parts of exploration area, and may not exceed 150,000 hectares. *Fiscal:* Guarantee deposit from applicant of $4,000 per lot applied for. Complementary deposit of $12,000 for each lot applied for and received. Such deposits are considered minimum expenditure for two years, and must be repeated at end of that time. Amount not spent in two years reverts to State. *Tax:* Exploration tax 10 US cents per hectare. Additional 10 cents per hectare tax in favor of National University. Exploration concessions have a four-year duration, extendible two years more if drilling rig installed and working. *Exploitation:* Maximum concession size is one-fourth exploration concession. Concessions may be freely chosen from the exploration concession, but their total area per single concessionaire may not exceed 150,000 hectares (370,500 acres). On discovery of production, the concessionaire "may" establish a refinery. Duration is 40 years; extendible on agreement between parties. Concessions to be granted on two zones, Atlantic and Pacific. Concessions may be received in either or both, but each must be separate. *Profits division:* 50-50 between government and company. *Royalty:* 16 2/3%, deductible for figuring 50-50 split. *Depletion:* 15% of gross production, also included in calculating 50-50 split. Exploitation tax progressive beginning at 80 US cents plus $1.00 per hectare for the university. All taxes deductible for 50-50 split.

EL SALVADOR

Reports from El Salvador indicate attempts to draft a new mining law have not been successful so far, and the present petroleum law will continue in effect for the foreseeable future. Under present law, subsoil oil rights are vested in the government.

Oil marketing activities now are operated under concession contracts with the Ministry of Hacienda, and include tax exemption for necessary equipment along with free entry privileges. These concessions, however, are granted under general legislation rather than specific petroleum laws.

GUATEMALA

Exploration was slowed by a government interpretation of the oil law which prevented application of exploratory costs against high surface rentals, contrary to the companies' expectations when they entered the country. The dispute was decided, and such deductions are to be permitted. The decision was made by the responsible ministry (Hacienda) which overruled the Mining Department.

HAITI

Changes have been contemplated in the oil legislation for a number of years, but no action has been taken due to internal disturbances.

HONDURAS

The Petroleum Law which was promulgated January 11, 1958, dated October 16, 1957, has been challenged as contrary to the constitution. On March 28, 1958, the government submitted a new law to the congress for approval. It contains some modifications, and is more attractive than the previous law. However, it has not as yet been passed.

NICARAGUA

The new oil law has been submitted, and has passed the lower house. The new law reserves large zones for development by nationals. No provisions affecting concessions already in force are contained, so they are presumably respected.

PANAMA

A new oil law is being drafted for Panama, according to unconfirmed reports. The International Cooperation Administration is reportedly contacting legal advisors for the country.

VENEZUELA

Agitation for a revision of oil laws is growing. Changes urged include larger percentage of profits to the government, and creation of a national petroleum enterprise to operate future concessions and refine all crude. Dr. Rafael Caldera, head of the COPEL party, indicates he wants (1) no change in 50-50 split; (2) the State should enter "actively into production, transportation, marketing, and refining" as a partner of the oil companies.

The *Official Gazette of Venezuela* of July 22 contains the text of regulations of the Minister of Mines and Hydrocarbons governing the transportation, storage, and installation of liquefied petroleum gas within the country. The regulations do not include operations within the production plant, refineries, natural-gasoline plant, or chemical-products plants. They do not cover transportation by sea or pipeline, nor operations or installations relating to the use of such gas in internal-combustion engines.

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Hotel Duane

PAUL G. GERVASI, MANAGER

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Overseas Exploration Company

The officers of Geo Prospectors Inc., together with R. E. McMillen, have formed a partnership for exploration activities overseas. The new firm, to be known as McMillen, Thralls, Green, Perry and House, will maintain headquarters in Tulsa. Geo Prospectors de France, which was formed earlier this year for operations in France and French territories, will be directed by the partnership through a resident manager at 6, Rue de Cerisoles, Paris VIII^{e}.

Mr. McMillen has been engaged in geophysical and geological exploration work for the past 19 years. He recently resigned as chief geophysicist of Midstates Oil Corp. He also served as geophysical exploration consultant for the Bureau de Recherches de Pétrole in Paris in recent years. Before joining Midstates, he worked in Venezuela and Columbia for Seismograph Service Corp. and Phillips Petroleum Co. He was chief geophysicist and assistant manager of exploration for Phillips in Venezuela from 1949 to 1953.

Geo Prospectors Inc. was formed in May 1955 by H. M. Thralls, T. S. Green, W. B. Perry, and A. M. House. Mr. Thralls was then chief geophysicist of Seismograph Service Corp. Mr. Green was geophysical-geological coordinator for Sunray Mid-Continent Oil Co., and Mr. Perry was chief geophysicist for Kerr-McGee Oil Industries. Mr. House was assistant manager of the geophysical instrument division of Seismograph Service Corp.

M. E. Roberts

R. E. McMillen

Roberts with Lummus

Martin E. Roberts has been elected vice president and a director of The Lummus Co. Canada Ltd., with offices at Montreal. He joined Lummus in 1946, as a process engineer. In 1954, he was assigned to The Lummus Co. Ltd. in London, and in 1956 he was transferred as manager of The Lummus Co. Canada Ltd., Montreal.

Oil Barge Loading Arms

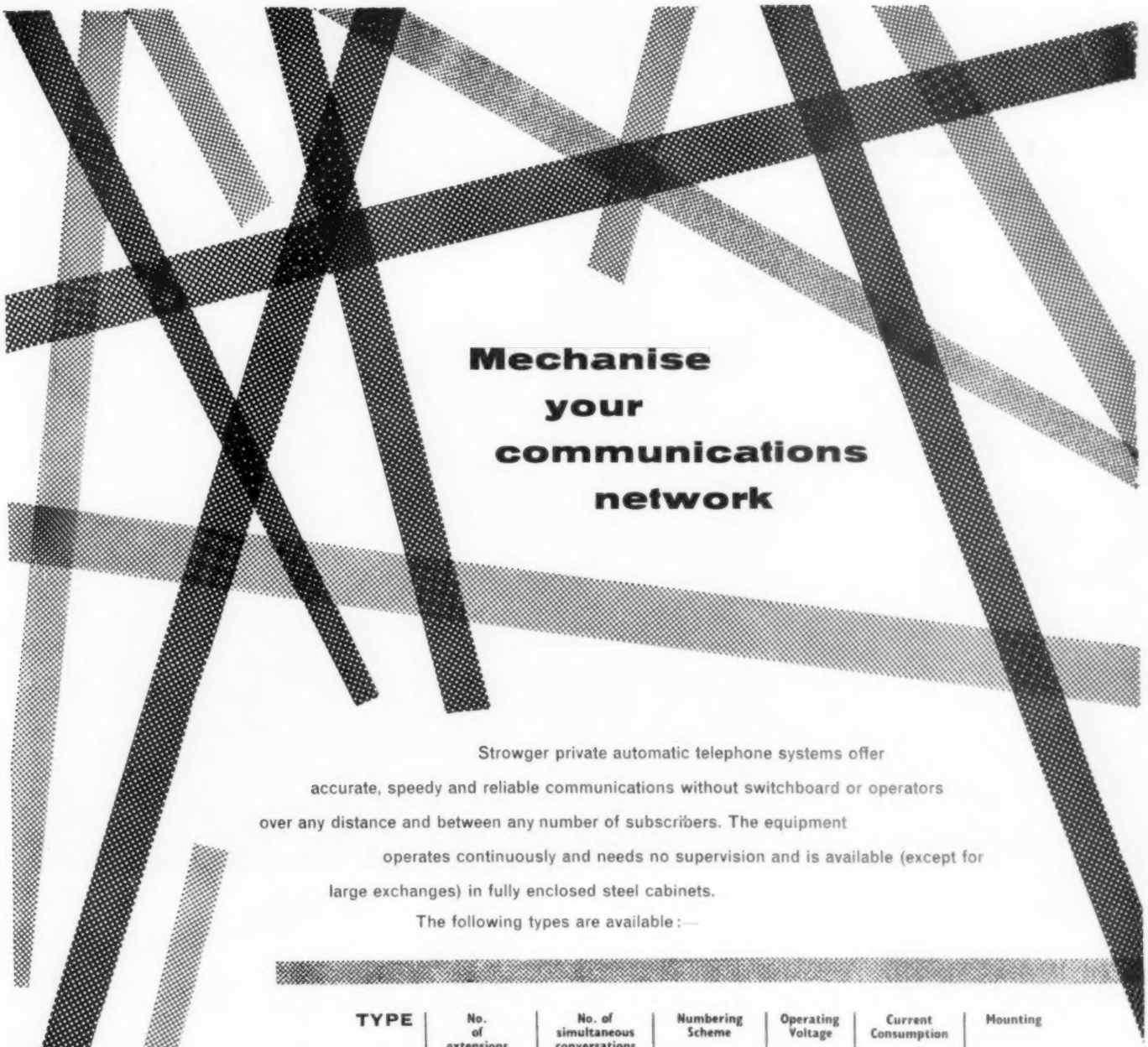
Two all-metal models of a river barge and lake tanker loading device have been developed by Chiksan Co., Brea, Calif. The new device, which is available in both 6-in. and 8-in. diameters, is said to prevent most line handling injuries, minimizes dock clutter and replacement costs, speeds barge loading time, and eliminates hose bursts. The company pioneered in developing hydraulically controlled marine loading arms for tankers some years ago.

C. O. WILLSON

One of the most widely known and respected members of the oil writers' fraternity died in Durango, Colo., September 19, while on a visit to his son. C. O. Willson succumbed to a heart attack at age 65; he had been in ill health for some time.

"Chuck" Willson, as he was known affectionately to his friends in the oil industry, had been a member of the editorial staff of the *Oil & Gas Journal* for 36 years and its editor for 17. Beginning his career as a newspaperman, he went to the journal in Tulsa in 1922, moving to New York several years later as refining editor. Returning to Tulsa in 1936, he directed all editorial activities until his resignation as editor in 1953, following a heart attack. From then until his death, he was consulting editor, and continued as full-time writer, editor, and traveler. He was a former president of the Tulsa Press Club; and a member of the National Press Club, AIME, Nomads, and othr civic and professional organizations.

"Chuck" will be missed by his oil writer colleagues, and their deepest sympathy goes to his sorrowing family, friends, and associates.



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The following types are available:—

TYPE	No. of extensions	No. of simultaneous conversations	Numbering Scheme	Operating Voltage	Current Consumption	Mounting
10/2	10	2	1—0	50	2A	Cabinet
25/4	25	4	21—20 31—30 41—45	50	2A	Cabinet
50/7	50	7	21—20 31—30 41—40 51—50 61—60	50		Cabinet
100/10	100	10	200—299	50	8A	Cabinet
200/20	200	20	200—399	50	16A	2 Cabinets
109	100 lines upwards (extensible)	as required	as determined	50	Dependent on No. of lines	Racks

Full details of these exchanges are described in a series of publications which will be sent on request.

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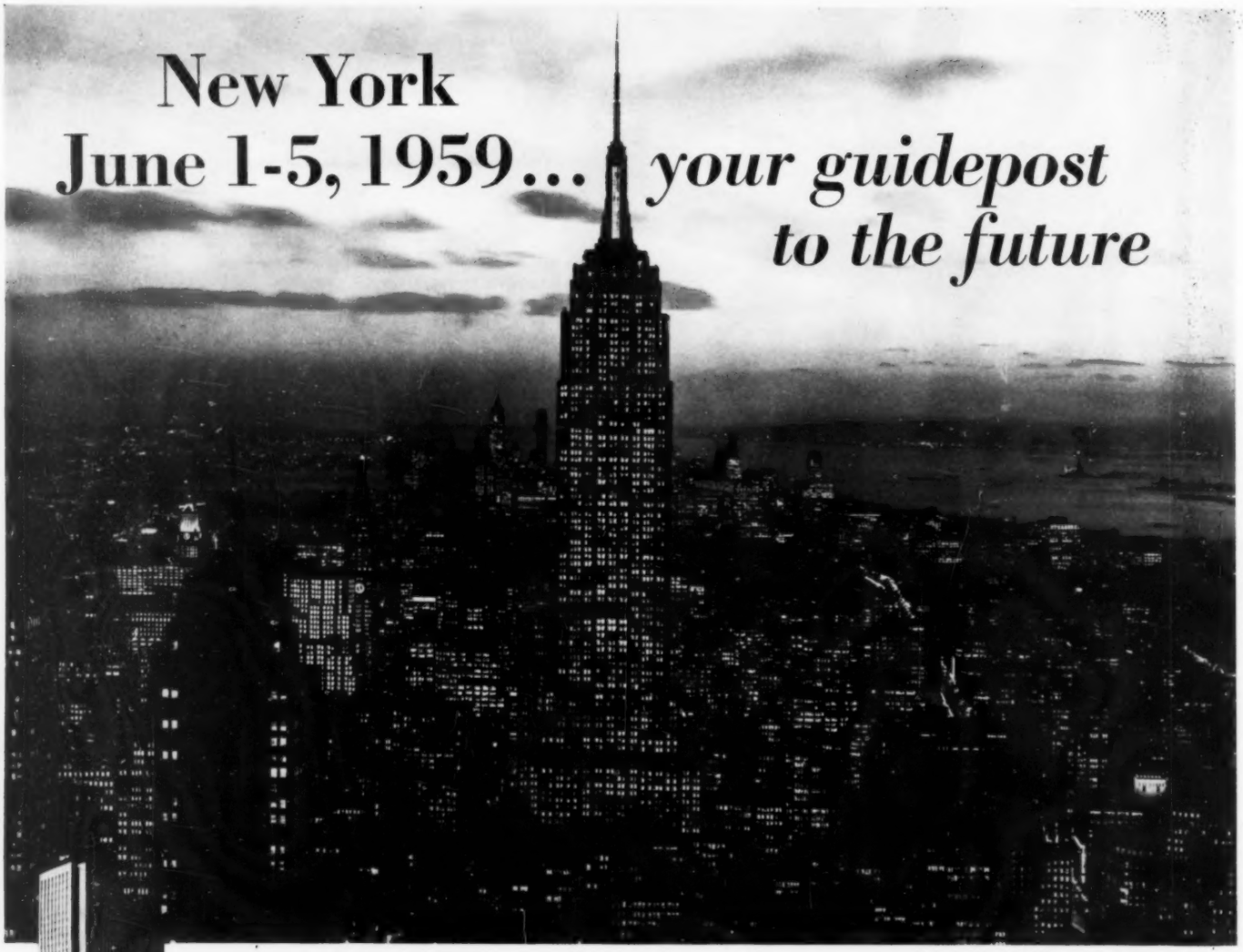
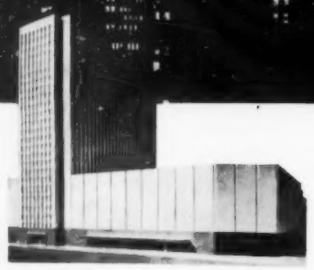
New York June 1-5, 1959... *your guidepost to the future*





Make your plans now to attend The Congress—May 31 to June 5, and the Exposition, June 1 to 5, 1959. What you will see and hear is important to you, and to your future, and to your firm.

For information on the Technical Sessions, write FIFTH WORLD PETROLEUM CONGRESS, INC., 527 Madison Ave., New York 22, N.Y.

Knowledge is the key to petroleum progress. And from May 31 to June 5, 1959 you have a unique opportunity to view and learn about the latest developments in petroleum. On those days the international petroleum community will be assembled at the famous New York Coliseum for the Fifth World Petroleum Congress and Exposition. Before your eyes will be spread an array of new equipment, materials, and techniques . . . many of immediate benefit to you in your operations.

90 Technical Sessions have been arranged at which papers on new advances in the industry will be presented. These sessions cover; Geology and Geophysics; Drilling and Production; Oil Processes and Refining; Chemicals from Petroleum and Natural Gas; Composition, Analysis and Testing; Utilization of Oil Products; Engineering, Equipment and Materials; Transportation and Distribution; Operations Research, Statistics and Education; a Symposium on Atomic Energy in the Petroleum Industry.

2 large floors of exhibits will present you with latest world-wide developments in the industry. Here you will be able to see and judge for yourself how they can help you raise your production and cut your costs.

New York as a tourist attraction offers you a world of things to see and do. The Coliseum, centrally-located at 59th Street and Columbus Circle, is just a few steps from the "Great White Way", the world famous New York theaters, and all the sights you'll want to see. In addition the city will be entering upon its annual Summer Festival with a full program of entertaining and interesting attractions. You won't want to miss it.

5th

WORLD PETROLEUM CONGRESS EXPOSITION

N. Y. COLISEUM JUNE 1-5, 1959

1959

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for the hundredth time.
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get on with selling Darlington Insulation."
"Pipes!" *cried the artist. "Now insulated*
pipes can't help looking abstract.
It's the shape they are. Anyway, there's
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and here it is.

306a

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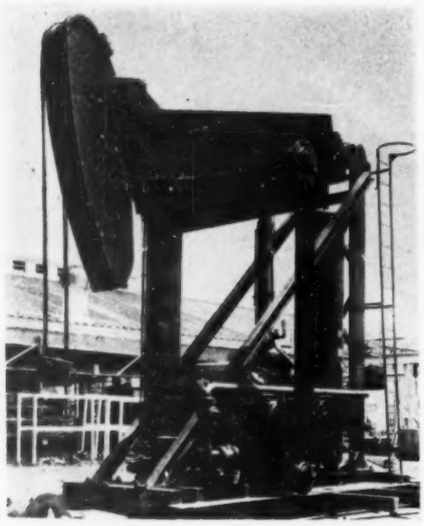


Test run of one of the world's largest capacity pumping units gets under way at the Coffeyville, Kansas, plant of The Parkersburg Rig & Reel Co. With a lifting capacity of 62,000 lb, the unit was designed especially for deep, heavy wells in South America.

Dresser Forms British Company

Dresser Industries Inc. has organized a British affiliate to be known as Dresser (Great Britain) Ltd. to coordinate and enlarge the company's present activities in the sterling market. Announcement was made in London late in September by J. B. O'Connor, president of the Dallas, Texas, company.

Dresser recently licensed Armstrong Siddeley Motors Ltd. to manufacture Clark gas turbines.

Dresser Industries Inc., at Claridges Hotel in London, to mark the formation of Dresser (GB) Ltd. Left to right: M. J. Galpin, Director of Dresser (GB) Ltd., London; J. B. O'Connor, President Dresser Industries Inc., Dallas, Texas; Douglas Cox, President Dresser AG, Zurich, Switzerland; and J. N. MacKendrick, President, Clark Bros. Co., Olean, N. Y.

Clark in Olean, N. Y., in turn is licensed to manufacture Ruston and Hornsby's English turbines.

Other Dresser agreements in England include those between Clark and Alley & MacLellan (Polmadie) Ltd., for the manufacture of Clark engines, compressors, and gas turbines in the UK; Pacific Pumps and Ideco Inc.'s agreements with the Pulsometer Engineering Co. Ltd. for the manufacture of Pacific pumps for the petroleum, refining, chemical, and other industries and Ideco mud pumps; Ideco Inc. also has an agreement with Woodfield Hoist and Associated Industries Ltd. covering Ideco full-view masts, drilling rigs, and other oil-field drilling equipment; Roots-Connersville Blowers Division agreement with W. C. Holmes & Co. Ltd. for the production of blowers and air-handling machinery; and the agreement between Southwestern Industrial Electronics Co. and Ernest Turner Electrical Instruments Ltd. with regard to the manufacture of certain geophysical instruments and equipment in the UK.

Another Dresser British organization, Security International CA sells Security rock bits manufactured by Security Rock Bits Ltd., a Dresser and English Drilling Equipment Co. Ltd. joint operation.

Dresser European operations are handled through a European subsidiary, Dresser AG., Zurich, Switzerland, of which Douglas Cox, of London, was recently appointed president and general manager. Dresser (Great Britain) Ltd. now operates as a subsidiary of Dresser AG. M. J. Galpin also of London, is a director of this affiliate.

Throughout the continent and other free trade areas, Dresser companies also have a total of 10 licencees in France, Germany, Holland, Italy, and Austria.

Heads Canadian Operations

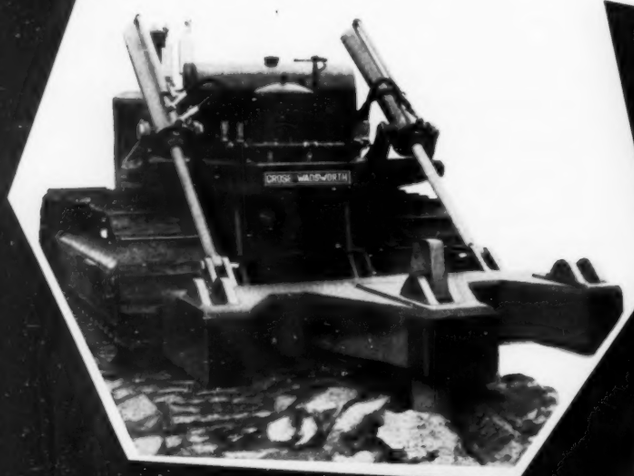
Jim Sayers has been appointed manager of Canadian operations for H. C. Smith Oil Tool Co. He will make his headquarters in Edmonton. For the past several years, Mr. Sayers was with Security Engineering Division, Dresser Industries Inc., as regional sales manager of their Rocky Mountain and Canadian divisions.

Oil States Engineering

Recently organized Oil States Engineering Co., Tulsa, Okla., has elected Charles A. Cone president. Mr. Cone is a former vice president of Dresser Engineering. W. G. Storey, former vice president of Trend Construction Co., is vice president.

Field engineer asigns test projects to operator of world's largest scraper during checkout near plant of R. G. Le Tourneau, Inc., at Longview, Texas.

SAVE TIME . . . SAVE MONEY . . . *on* **TOUGHEST** *construction jobs*



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Built with either drawbar or track frame mounts, here is the original rock ripper that puts more profit dollars into pipeline construction work. The Crose-Wadsworth Heavy Duty Rock Ripper eliminates up to 80% of blasting operations . . . digs right in and goes to work where a trenching machine can't! Write today for new brochure.

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Blaw-Knox Appointments

Blaw-Knox Co., Buflovak equipment division, Buffalo, N. Y., has announced appointment of James T. Langham, of James T. Langham & Associates, oil and gas consultants, as sales representative for Blaw-Knox gas cleaners in Oklahoma, Louisiana, and Texas. Headquarters are at 1202 Gulf State Bldg., Dallas, Texas. Robert B. Scrimgeour becomes special sales representative for the company's ROTO-VAK agitated film contactor.

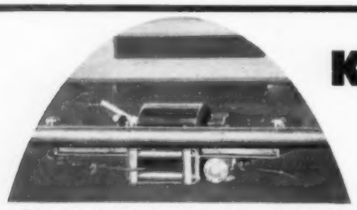
Cooper-Bessemer in Texas

Acquisition of Creole Engineering Inc., Houston, as a new wholly owned manufacturing and engineering subsidiary has been announced by E. L. Miller, president and general manager, Cooper-Bessemer Corp., Mount Vernon, Ohio. The entire Houston operation is to be headed by T. E. Kramer as president. Mr. Kramer was formerly district manager of Cooper-Bessemer's Caracas, Venezuela, office, and more recently of the New Orleans office.

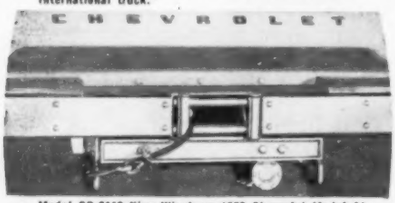
Initial engineering and construction at the company's Houston subsidiary will concentrate on the completely packaged prepiped gas-engine compressor units currently being marketed by Cooper-Bessemer throughout the world, but formerly packaged by other companies.

Century Geophysical-Schlumberger

Century Geophysical Corp., Tulsa, has joined with Schlumberger Well Sureying Corp. to provide the USA oil industry with a geophysical velocity logging service to be known as the Seismic Reference Service (SRS). Schlumberger has an international operation with main offices in Paris, France, and American headquarters in Houston, Texas. Century has established a data center in its Tulsa headquarters to process and evaluate results obtained by its field SRS crews.



Model A-11 King Winch on A-120 (4x4) all-wheel-drive International truck.*



Model CD-8116 King Winch on 1958 Chevrolet Model 31 (4x4).

Model 151J King Winch on Willys Jeep.

KING WINCHES

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COMPLETE, READY-TO-INSTALL KING FRONT-MOUNT WINCH ASSEMBLIES FEATURE:

- winch side arms to reinforce truck frame
- bronze-bushed, 4-way cable guide rollers
- cable drum guard
- heavy-duty pipe bumper
- needle-bearing, universal-joint spline-shaft drive assembly
- Timken bearings on worm

King Winches keep you moving through the most difficult terrain . . . you get action where there's no traction with dependable pulling power. King power winches have pulling capacities of 8,000 to 19,000 lbs.

* *King Winches for International trucks are available through International-Harvester dealers.*

Koenig ALL-STEEL CABS FOR JEEPS

FULL AND HALF CABS

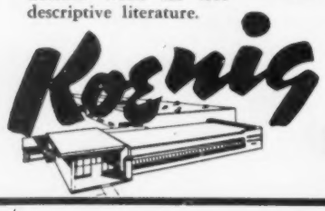
Full Cab and Model 151J King Winch Illustrated.

Koenig Jeep cabs and King Winches for Willys vehicles are available through Willys Motors, Inc., and Willys-Overland Export Corp. distributors or dealers. Write for free descriptive literature.

KOENIG ALL-STEEL CABS HAVE THESE SUPERIOR FEATURES:

- PROTECTION
- SAFETY
- COMFORT
- CONVENIENCE

Roll-down windows, full opening . . . full panel-board head lining and masonite door lining . . . safety glass throughout . . . all-steel welded construction . . . door locks.



IRON WORKS, Inc.

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J. F. Maher

R. O. Shaffer

Reed Roller Bit Slate

The board of Reed Roller Bit Co., Houston, recently elected a new chairman, a new president, three new directors, and announced retirement of Rex G. Hamaker, director and president of the company.

Ray O. Shaffer, president of Welex Inc., Fort Worth, was elected a director, and will serve as Reed Roller Bit chairman. John F. Maher, formerly president of Oil Center Tool Co., Houston, is now a director and the new president of Reed Roller Bit Co. A. H. Rowan, chairman of Rowan Drilling Co., Fort Worth, is the other new director.

Members remaining on the board are John H. Blaffer, S. P. Farish, Claud B. Hamill, J. W. Link, Jr., John Mecom, and Wharton Weems.

New Milwhite Salesman

John W. Bull has been transferred to Houston as city salesman of the Milwhite Mud Sales Co., a subsidiary of the Mississippi River Fuel Corp. Mr. Bull has been with Milwhite for the past five years as an engineer in West Texas and city salesman in Dallas and Fort Worth.

Sucker-Rod Coupling

Axelson Manufacturing Co. has developed a corrosion- and wear-resistant API sucker-rod coupling. With a friction coefficient of 0.10, the coupling has shown a wear reduction of 2 to 1 in tests with low-water production; and more sustantial reduction in tubing and coupling wear may be expected in high-water-cut, crooked-hole, and abrasive wells.

Plastic Pipe Liner

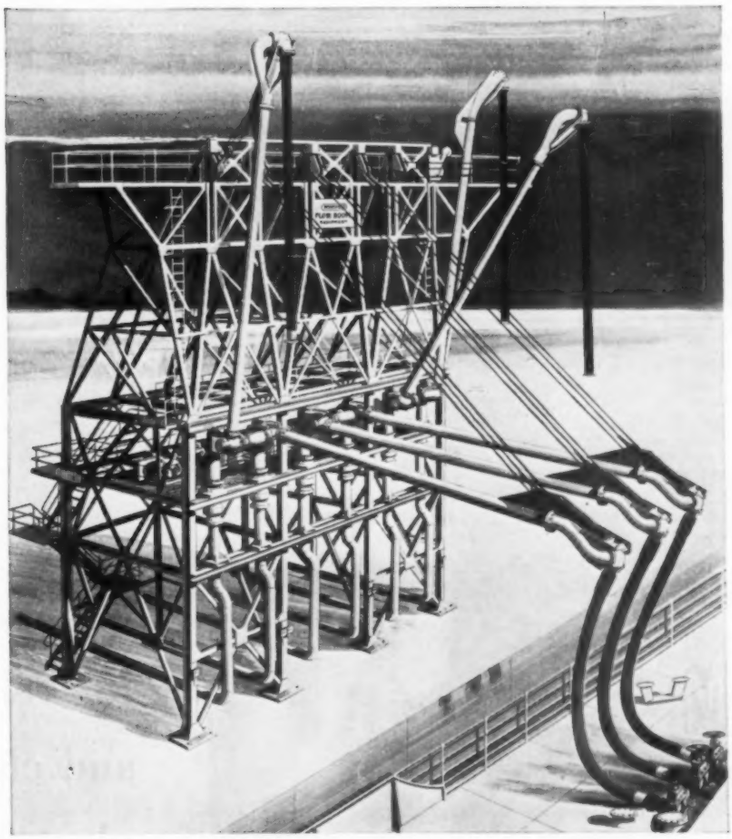
The Sievers Co., Long Beach, Calif., has developed a plastic liner for oil-well tubing for use in corrosive situations. The pipe is a composite of fiber glass, polyvinyl chloride, and epoxy resins. It may be saw-slotted, gun-perforated, or worked like steel.

The new 30,000-ton tanker, SS ATLANTIC ENTERPRISE, during her recent sea trials in the Delaware Bay after delivery by her builder, The Sun Ship-building and Dry Dock Co. With a capacity of 250,500 bbl, this 641-ft supertanker is now being used by the Atlantic Refining Co. to transport petroleum products from its Texas refinery to its East Coast terminals.

WOODFIELD FLOW BOOM EQUIPMENT

loads and unloads Tankers from 2,000 to 100,000 tons capacity

and allows for manifold rise and fall of 75ft.



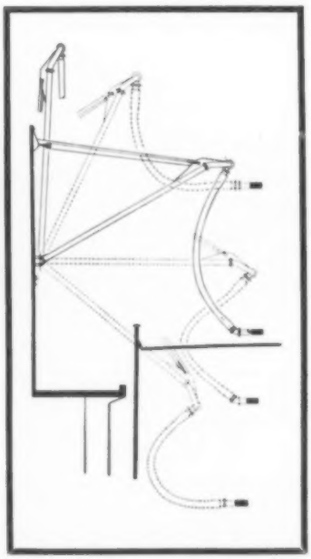


Diagram showing luffing motion of Flow Boom. This system can be designed to accommodate tankers ranging from 2,000 to 100,000 tons, and to suit local berthing conditions anywhere in the world.

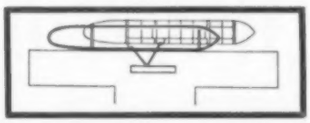


Diagram illustrating manner in which free slewing of Flow Boom permits safe tanker drift.

Woodfield Flow Boom Equipment features these vital advantages:—

- ★ **Slewing arcs in excess of 120° allow wide tolerances in tanker spotting and drift.**
- ★ **With this equipment tanker manifold heights may vary by 75 ft.: subject to sizes of tankers handled and local tide conditions.**
- ★ **Boomhead Swivel, exclusive Woodfield development ensures minimum restraint and maximum life of hoses.**
- ★ **Standard Boom lengths 30 ft. and 40 ft.**
- ★ **King Posts: Exclusive Woodfield feature, including Woodfield Joints.**
- ★ **Use of flexible hose kept to minimum.**
- ★ **Boom sizes: 8", 10", 12" and 16" nominal bore.**
- ★ **Structure: Designed individually to meet site requirements.**
- ★ **Control: Pneumatic, Hydraulic or electric operation reduces operator technique to minimum. Dual push-button control at upper deck and jetty level requires minimum supervision and effort.**

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London Office: 147 Victoria Street S.W.1

Davidson at Hawthorne

W. A. Davidson has been appointed assistant sales manager at Herb J. Hawthorne Inc., Houston, Texas, manufacturer of rotary drill bits for the seismic drilling industry. Mr. Davidson joined the Hawthorne sales staff as a sales representative in February, following 11 years' association with a major oil-industry supply firm. He had served as division manager for West Texas-New Mexico, and more recently as division manager in charge of industrial sales for the Houston area, before joining Hawthorne.

New B-W Valves

A new line of directional control valves for hydraulic oil systems is now available from Wooster Division, Borg-Warner Corp., Bedford, Ohio. Nominal ratings from 5 to 25 gpm and up to 6-spool configuration are offered in the new line. The new Wooster valves are designed for operating pressures up to 2,000 psi. Valves for applications where operating pressures exceed 2,000 psi can be obtained on special order.

New Fire Hose

A new rubber-lined fire hose, stronger yet lighter in weight than conventional hose, has been developed by Hewitt-Robbins Inc. A jacket of cotton-dacron fabric and an inner tube of neoprene synthetic rubber give greater strength, lighter weight, and more flexibility, making it easier to handle. The long-life rubber lining also eliminates the "weeping" usually associated with unlined linen hose. Called "Rack-N-Reel," the hose is available in maximum lengths of 100 ft, 1½-in. inside diameter.

English Ideco Pumps

Pulsometer Engineering Co. Ltd. is building Ideco mud pumps. Another English licensee, Woodfield Rochester Ltd., has been building complete Ideco rigs since 1952, and would make pumps and replacement parts readily available to customers in the sterling areas. Component parts are interchangeable between pumps, drawworks, and structures whether manufactured in England, France, Austria, Italy, or in Ideco's home plant at Beaumont, Texas.

Baroid Changes

Baroid Division of National Lead Co. has announced appointment of R. E. Souther as manager of foreign operations. Succeedinghim as manager of well logging is B. O. Pixler. S. E. Geffen has been appointed area well-logging superintendent at Denver. Wendell H. Russell has returned to Houston general offices as assistant manager of well-logging department. H. I. Bussa becomes administrative assistant to manager of drilling-mud department in general offices. Replacing Mr. Bussa as assistant manager of lower Texas Gulf Coast area office is Kemp S. Lewis. B. F. Stiba has been appointed sales manager in lower Texas Gulf Coast area, at downtown Houston office.

Rolo Appoints Allen

I. B. Allen has been appointed Venezuelan representative for Rolo Manufacturing Co. of Houston. He was formerly with Stanolind in the USA, and was subsequently president of PETICON, in Venezuela. He will make his headquarters in Caracas, and will handle Rolo's line of oil metering equipment, including the HI-CAP metering separator.

5% Oil-Demand Rise for 1959

Tidewater executive has reported domestic oil demand should rise by 4% to 5% in 1959, while Free World demand outside USA is expected to increase by 7% to 8%. Entire 1958 oil demand is likely to rise 1% to 2% over 1957. This compares with the 4% annual average during 1952-57.

SA Office for Graver

The International Division of Graver Tank and Manufacturing Inc. has established an office in Caracas, Venezuela. William I. Woodson has been appointed general manager of Venezuelan operations. The new South American office will enable Graver to offer its complete line of equipment, including large floating-roof tanks, for sale and erection in Venezuela.

Sohio's New Toledo Refinery

The new $40 million Toledo refinery of The Standard Oil Co. (Ohio) has gone onstream. The new refinery will add about 25% to the company's existing crude-oil capacity and double the capacity it had only 10 years ago.

Consultant Appointment

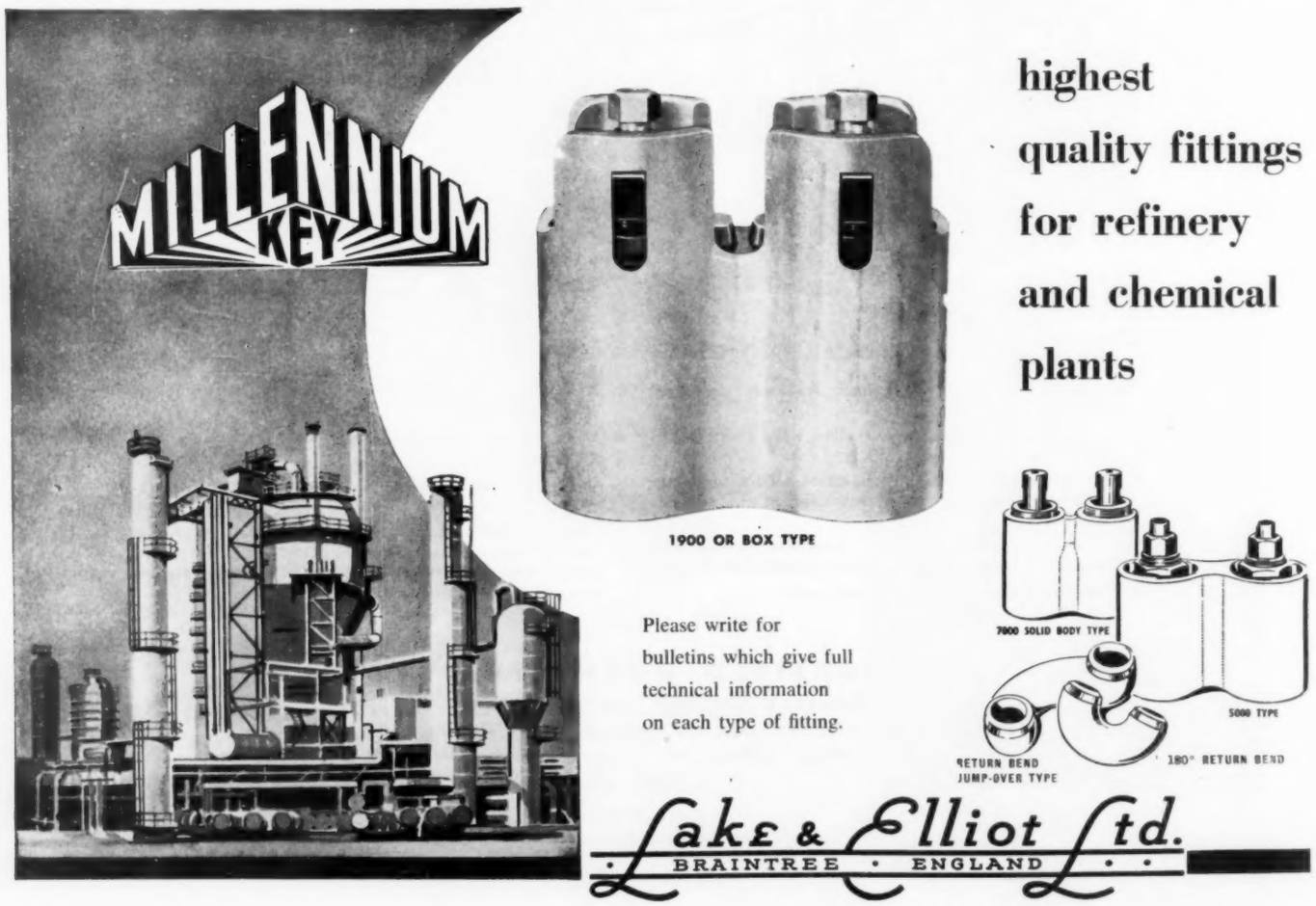
Gordon L. Romine, petroleum engineer, has joined the staff of Keplinger and Wanenmacher, petroleum engineering and management consultants, at Tulsa, as of August 1. Mr. Romine has been with Lion Oil Co. since mid-1954.

Petrochemical Plant

Ftalital SpA Milano, Italy, will build a 2,2000,000-lb-per-year maleic anhydride plant at Scanzorosciate (Bergamo), Italy, the first to be built in that country. Scientific Design Co. Inc. and Ste. Française des Sérvices Techniques Sarl, Paris, will furnish the process engineering and major equipment design.

Pacific Coop Refinery

A 15,000 b/d refinery is to be erected at Vancouver, Wash., by Pacific Cooperatives on a 110-acre site adjacent to deep water. The coop distributed $14 million of petroleum products annually through 120 member associations.



THE "EVGENIA NIARCHOS"

sister vessel to the highly successful *Spyros Niarchos*, is now in service. On an overall length of 757 feet, she carries 47,000 tons deadweight and has a maximum power of 20,000 S.H.P. Her propeller, like that of the *Spyros Niarchos*, is the largest manufactured in Novoston alloy. It is of Heliston design, five-bladed and weighs 30½ tons.

Photograph by courtesy of the builders, Vickers-Armstrongs (Shipbuilders) Ltd.

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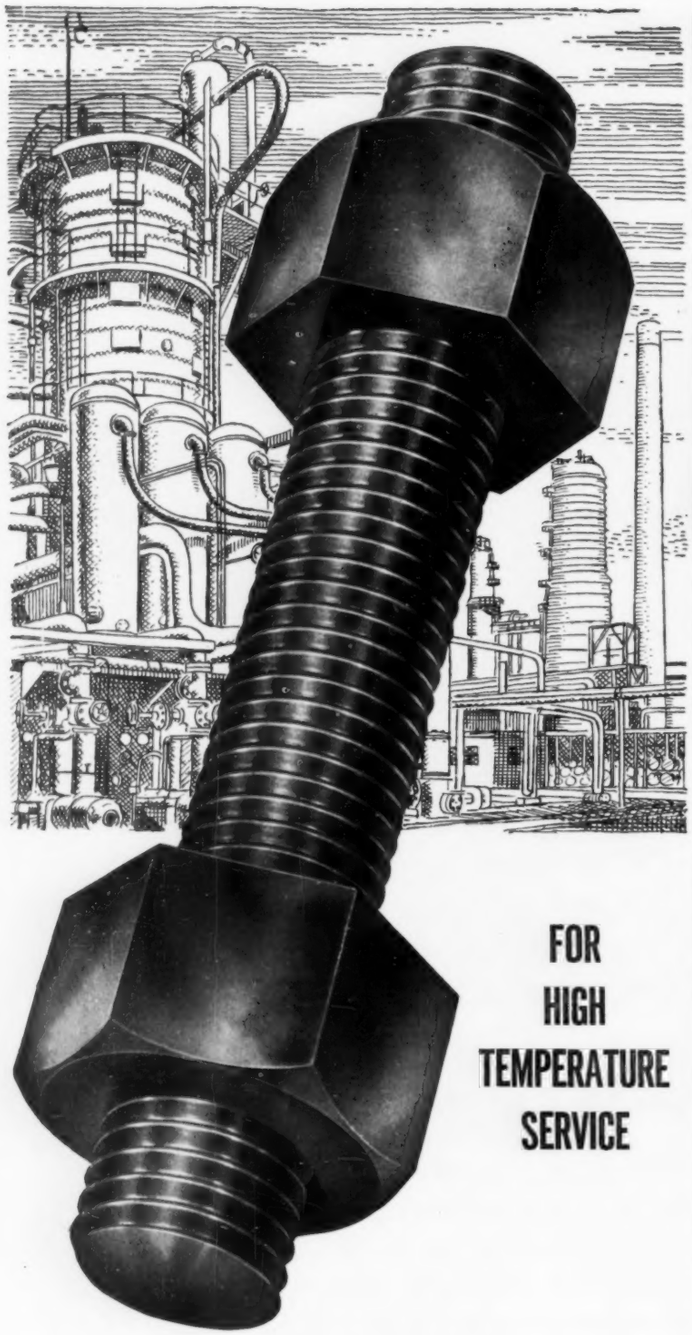

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DOTY GROVE VALVE VP

Appointment of three regional sales managers, a service manager, and the naming of George E. Doty as vice president and general sales manager of Grove Valve and Regulator Co. have been announced by M. H. Grove, company president. Mr. Doty will be headquartered in Grove's Oakland offices. R. L. Briggs will serve as central regional sales manager, with offices in Tulsa. W. J. Hancock will head the eastern region, in Houston; and C. W. Cook western region sales, also in Houston, F. A. Fergusson will be located in Houston, but will have nationwide responsibility as service manager for the company.

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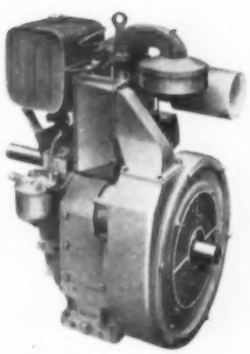

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Sun Begins Supertanker

First section of the 695-ft keel of a new Sun Oil Co. supertanker has been laid at Sun Shipbuilding & Dry Dock Co., Chester, Pa. Largest ship ever to be built at Sun Ship, which has just completed a multimillion-dollar expansion program, the supertanker will be 47,750 dwt with a cargo capacity of 372,000 bbl. Its estimated cost, when completed, will be approximately $13 million. A single-screw turbine-driven tanker, she is designed to travel at 17 knots at normal shaft horsepower of 18,500.

New features to be built into the vessel include: a teardrop-shaped wheelhouse with 360 visibility; a dead-reckoning analyzer for operating under non-Loran conditions, such as fog; a new-type radar reflection plotter, enabling the radar operator more easily and quickly to observe the speed and changes in direction of other objects or ships at sea.

The keel of a second vessel of this type is expected to be laid early next year, on Sun Ship's No. 8 Way. Construction time will be between 12 and 14 months on each vessel. Neither will be given a name until about a month from their launching.

Shell Sulfur Unit

A 150-ton sulfur-recovery plant will be built by The Anlin Co. adjacent to Shell Oil Co.'s Wood River, Ill., refinery. The $2 million unit will be completed by the middle of 1959. Chemical Engineering Associates will design the plant, and Industrial Gencon Inc. will build it.

New Signal Oil Building

Signal Oil & Gas Co. will soon be headquartered in a new 15-story building in downtown Los Angeles. Construction of the completely modern $5 million office structure on Wilshire Boulevard, is scheduled to begin about Nov. 1, and to be ready for occupancy by the spring of 1960.

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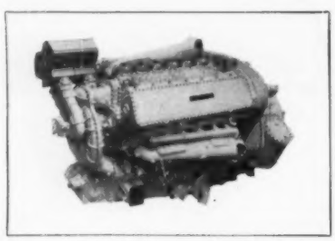

Napier Deltic 18-cyl. opposed piston, 2-stroke diesel marine power unit.

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Deltics can cruise a 50-passenger launch at 35 m.p.h. with a comfortable reserve of power in hand.

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The boat illustrated is one of the fleet of Thornycroft-built, twin Deltic powered, 50-passenger crew launches operated by the Shell Petroleum Company on Lake Maracaibo. Plans of Deltic powered crew boats suitable for Gulf operation are available.

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How New Import Plan Works

US Interior Department officials have made estimates showing the effect of the proposed new crude-oil imports program on each of 38 present importers. Some, like Standard of California, would be cut drastically. Others, like Standard of Indiana, would get far larger quotas. Total allowed crude imports under the proposed program would be 826,300—751,300 b/d of crude oil and 75,000 b/d of unfinished oils. (The program applies to Districts I through IV only.)

Difference between what present importers are allowed and this total would be available for newcomers. The company-by-company figures in the accompanying table are estimates, on the basis of assumed refinery runs of 90% of capacity.

The first column is the allocation September 1, 1958; the second, the January 1 quota; and the third, the July 1, 1959 quota; the fourth, the January 1, 1960 quota.

	Sept. 1 1958	Jan. 1 1959	July 1 1959	Jan. 1 1960
Atlantic Refining Co.	50.2	50.2	30.2	21.3
Aurora Gasoline	3.5	4.1	5.5	6.8
Bay Refining	2.7	3.9	2.9	2.9
Cities Service	27.8	27.8	27.8	29.0
Clark Oil	2.0	2.3	3.0	3.8
Continental	5.0	8.9	12.1	15.1
Crown Central	4.3	4.3	4.3	4.1
Danaho Refining	0.5	0.5	0.5	0.5
Delta Refining	3.0	3.0	1.7	1.2
Eastern States	15.6	15.6	8.9	6.3
Gabriel	6.4	4.0	2.0	0.0
Great Northern	28.1	28.1	28.1	28.1
Gulf	95.1	95.1	85.6	60.1
Hess Inc.	9.8	6.6	3.2	0.0
Ingram Oil	3.5	3.5	2.3	1.6
International	10.5	10.5	10.5	10.5
Lakehead Pipeline	0.3	0.3	0.3	0.3
Lake Superior	4.3	4.3	4.3	4.3
Northwestern	11.5	11.5	11.5	11.5
Ohio Oil	3.5	3.5	3.4	4.3
Phillips Petroleum	10.2	15.5	20.9	26.2
Pure Oil	5.0	10.9	14.8	18.5
Republic Oil	4.0	4.0	4.5	5.6
Shell	6.4	23.7	32.0	40.0
Sinclair	53.0	53.0	53.0	45.9
Standard of California	56.9	56.9	30.9	21.7
Socony Mobil	57.2	57.2	57.2	50.2
Standard of Indiana	25.4	44.3	59.8	74.7
Standard of NJ	61.4	61.4	76.3	98.4
Standard of Ohio	7.0	8.4	11.3	14.1
Sun Oil	43.0	43.0	36.6	25.8
Sunray	5.0	7.0	9.4	11.7
Southwestern	2.5	3.0	4.1	5.1
Tennessee Gas Trans.	3.5	3.5	3.5	3.5
Texas	46.4	46.4	49.1	61.4
Texas Asphalt	2.0	1.8	0.6	0.4
Texas City	4.0	4.0	4.0	3.5
Tidewater	29.2	29.2	17.3	12.2
United Refining	3.0	3.0	1.2	0.8

The outlook is that the plan will go into effect, perhaps by January 1, as proposed, but with some changes to meet suggestions and objections. The Cabinet Committee on Crude oil Imports is sympathetic to the plan. Venezuela and Canada have given signs they are agreeable. And Independent Petroleum Assn. of America calls it "a great improvement."

From the standpoint of the USA producer of crude oil, the program will mean little change, as the total of allowed imports is about the same under the new program as presently. The new program sets a top limit on crude imports of 751,300 b/d, 12% of estimated domestic production. It allows in, also, 75,000 b/d of unfinished oils, and it lets in some crude for asphalt outside the overall total. Estimates are the asphaltic crude offset will be about 50,000 b/d.

While the proposed program is based on 12% of domestic production, future talk of it is to be in terms of 10.11% of total demand, which works out to about the same figure. One reason for this is to bar criticism of the program when crude-oil production drops.

Main impact of the program is upon individual importers, whose import quotas will be changed markedly with a switch to a refinery-runs basis to determine allowed imports for each company. At present, import quotas for companies are based upon the history of a company's imports.

Canadian opposition to the plan collapsed with

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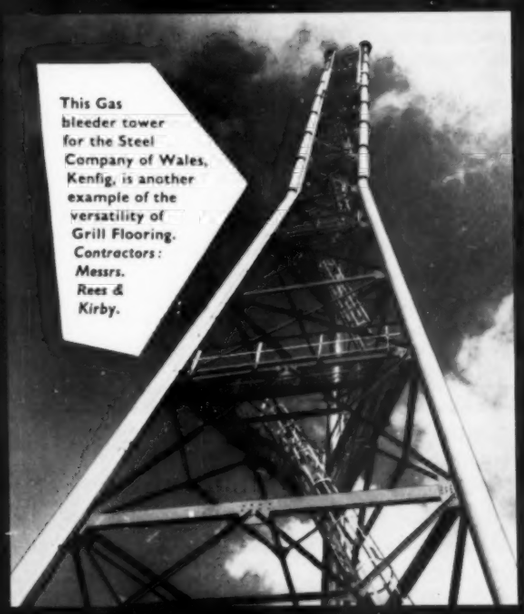

This Gas bleeder tower for the Steel Company of Wales, Kenfig, is another example of the versatility of Grill Flooring. *Contractors: Messrs. Rees & Kirby.*

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Features of the Vokes N.C. Exhaust Silencer:

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insertion of a clause giving special treatment to northern USA refiners which operate largely on Canadian crude. These plants will be exempted from the overall percentage list on foreign crude to refinery runs if they can show there is not an economic source of domestic crude. Interior's Carson said this means there will be no cut in Canadian crude-oil imports. Without this clause, he said, the present flow of 60,000 b/d from Canada to the USA Midwest would have been cut to 20,000 b/d. Another 23,000 b/d of Canadian crude goes to the Far West of the USA.

Need for the program, or some sort of program, lies in the chaotic conditions which have been developing under the present system. Thus, against a total quota of 713,000 now allowed, there are applications on file to bring in 980,316 b/d over and above the allowable.

Captain Carson, who proposed the new program, has been running the program without standards or rules. The new program is designed to set up a yardstick as to who is entitled to a quota and how much quota to import crude oil.

Signal-Hancock Merger

Signal Oil & Gas Co. and Hancock Oil Co. have merged to form a new $500 million independent company, to be known as Signal Oil & Gas Co.

Samuel B. Mosher will be chairman and chief executive officer, and Russell H. Green will continue to serve as president. Present members of the boards of both companies are to be named to the board of the merged company.

Domestic oil production of the new company is 65,000 b/d, plus approximately 12,500 b/d natural-gasoline and liquefied petroleum products. Natural-gas sales amount to 70,000 mcf/d. Plans are under way to rebuild Hancock's Long Beach refinery which was partly destroyed by fire. New refining facilities will be undertaken for the group in the San Francisco Bay area as well as in the Northwest.

Internationally, the two companies own a total of 50% in a 43-square-mile concession in Lake Maracaibo, where to date a total of six wells have been completed and tested for a combined total of approximately 40,000 b/d. Two rigs are currently drilling on this concession.

The two companies own identical oil interests in Iran and in the Kuwait Neutral Zone. In Iran, their joint interests amount to approximately 10,000 b/d, while in Kuwait the companies will jointly own a 30% interest in the American Independent Oil Co. Net production of the new company from these Middle East holdings approximate 25,000 b/d.

New House Magazine

Stratoflex Inc., Fort Worth, one of the Kendaris Industries companies, has begun publication of a house magazine named *To the Moon*. The name was selected by Victor LeMay, public-relations director, to suggest that the company's product is as modern as the space age.

Polypropylene Plant

Humble Oil and Refining Co. will erect a polypropylene plant at Baytown, Texas, in 1959. The plant will have a capacity of 40 million pounds yearly. Enjay Co. and Spencer Chemical Co. will market the output. Only present manufacturer in the USA is Hercules Powder Co.

Oil Investment Erratum

September *World Petroleum*, page 96, reported capital expenditures in 1957 at $11 billion by the international petroleum industry, and gross investment in fixed assets in the Free World by the end of 1957 at approximately $78 billion. These figures refer to the whole international industry. The three tables accompanying this article refer to 33 oil companies only; thus total investment in the Free World for 33 companies was $5.4 billion in 1957; and gross investment to the end of 1957 for the same 33 companies $41.6 billion.

These figures are based on a study by the Chase Manhattan Bank.

Indiana Standard $200 Million Issue

Standard Oil Co. (Indiana) has issued $200 million in 4½% debentures, due October 1, 1983. They are offered at 99% and accrued interest to yield about 4.57% to maturity. An underwriting group headed by Morgan Stanley is placing the issue on the market.

Most of this money will presumably go to financing the far-flung operations of the Pan American International Oil Co. This company, headed by Christian F. Dohm, has operated in jet-propelled fashion to take up some of the world's choicest exploration acreage. Holdings acquired in less than a year include the very favorable part of the Iranian offshore area which lies at the head of the Persian Gulf and opposite Safaniyah, the large offshore field discovered some years ago; acreage in Libya, Algeria, Italy, Argentina, and other localities. The $200 million will just about finance Pan American's operations for four years.

Standard of Indiana and its subsidiaries constitute one of the largest integrated organizations in the petroleum industry. Its products are marketed in all of the 48 states. Company net reserves as of December 31, 1957, in the United States and Canada were 2,174 million barrels of crude oil and natural-gas liquids and 12,720 billion cubic feet of natural gas. The company's 13 domestic refineries had an aggregate crude running capacity at June 30, 1958, of 725,000 b/d.

Esso Has Multi-Lingual Film

Standard Oil Co. (New Jersey) and its worldwide affiliates will soon be distributing their 13-minute humorous color cartoon film, "Energetically Yours," in eight different languages. Transfilm originally produced it in English only, but it will now have versions in Spanish, Portuguese, German, French, Swedish, Norwegian, and Italian. Soon after the film had been premiered on Jersey Standard's 75th anniversary television show in late 1957, requests for it poured in from Europe and South America, as well as the United States.

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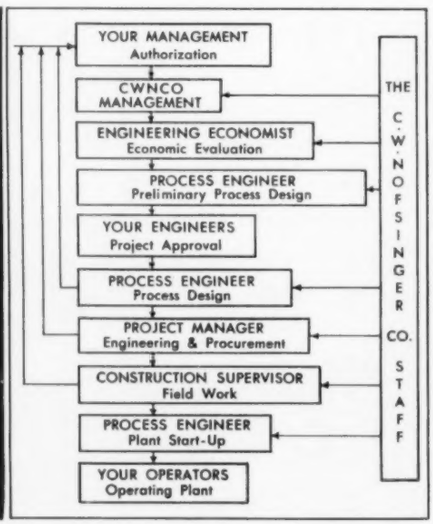

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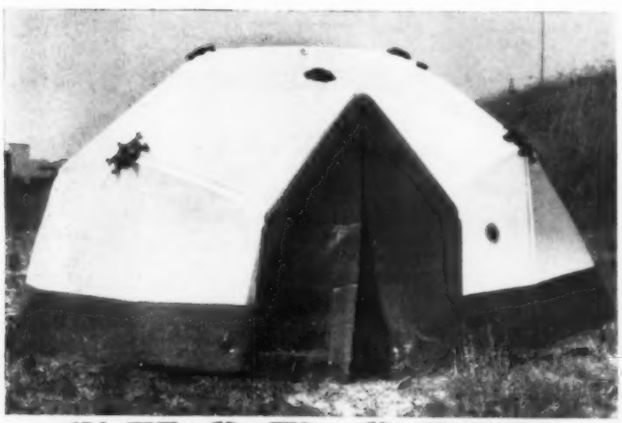

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NOW...a safe, tight seal for any Floating Roof

The new Horton Fabric Seal extends the "no vapor space" concept of a floating roof tank *all the way to the tank shell* . . . using a tough, long lasting fabric that conforms to any shell irregularity or tank out-of-roundness.

Recent development of this composite fabric now allows CB&I to bring into *practical* use a basic idea first patented by the Company in 1937.

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Contact our nearest sales office for complete information about the new Horton Fabric Seal, designed by CB&I with the "know-how" gained from 35 years of experience in building floating roofs.

Write our nearest office for your copy of the new *Horton Fabric Seal* brochure.

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- Explosive mixtures directly above liquid are eliminated

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- Galvanized weather shield protects sealing band from reflected sunlight, rain, snow, etc.

SERVICEABLE

- Full protection for oxygen sensitive stocks
- All moving parts immersed as protection against corrosion
- Intimate contact to tank shell, including irregularities, for full travel of floating roof

At your service . . .

CB&I's extensive experience with *all* types of sealing designs is at your disposal. For an accurate appraisal of the proper design for your storage conditions . . . call or write the nearest CB&I office.

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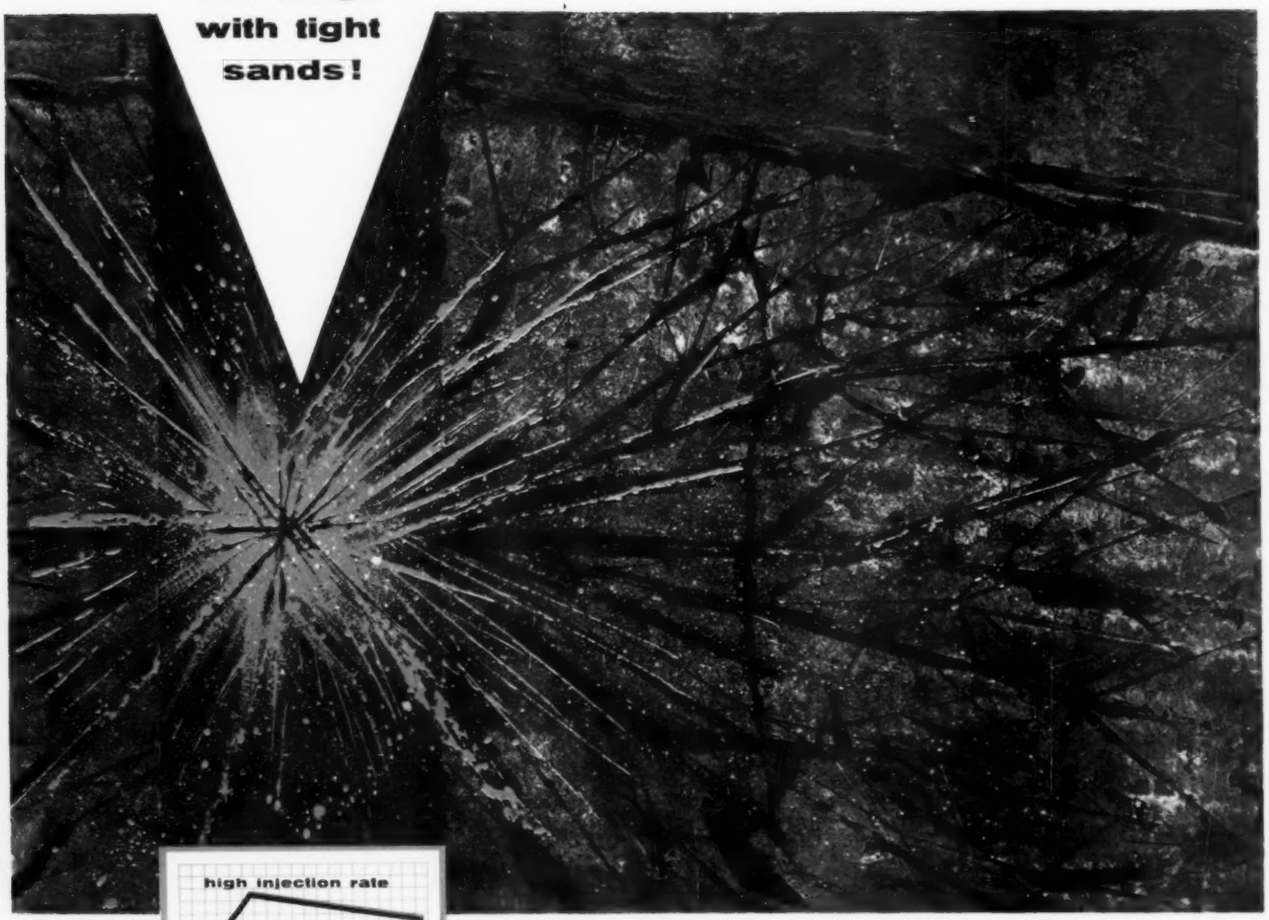
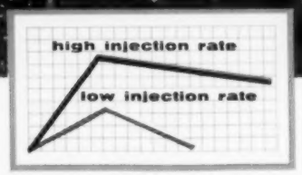
Get tough with tight sands!





High injection rates have shown greater production and slower decline.

In most things, gentleness is good and proper.

But not so with some oil and gas reservoirs. To make them *give*, often calls for a "get tough" policy.

Dowell knows how to get tough with tight sands, and has the equipment needed to do it. Exclusive with Dowell is the new high-injection-rate "Frac Team": 1) the mighty Allison Pumper with power to spare, 2) the Remote Panel for safer operation, and 3) the Dowell Blender for precise control of sand and fluid mixing.

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